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TESTING COLLABORATIVE GAMIFICATION APPROACH ON PUPILS' BASIC SCIENCE AND TECHNOLOGY CONCEPTS LEARNING OUTCOMES IN ONITSHA, EDUCATION ZONE, ANAMBRA STATE, NIGERIA

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Abstract

The study investigate the effect of collaborative gamification approach on the achievement and attitude of primary school pupils in Onitsha North, Anambra State. It also examined the moderating effect of gender on the attitude and achievement. The study adopted a pretest-posttest control group quasi experimental research design of 2×2×2 factorial matrix with a sample of 280 intact class from three purposively selected schools in Onitsha North, comprising of (132) male and (148) female. Eight validated instruments were used for data collection including Basic Science and Technology Achievement Test (BSTAT) with (r=0.79), Questionnaire on Pupils' Attitude to Basic Science and Technology (QPABST) (r=0.96). Data were analysed using inferential statistics and hypotheses were tested at P<0.05 using ANCOVA. Results revealed that there was a significant main effect of treatment on the achievement of primary school pupils in Basic Science and Technology (BST) ($F_{(1;275)}$ = 101.89; P< 0.05) ; There was a significant main effect of treatment on the attitude of pupils in BST ($F_{(1,275)}$ =138.03; p< 0.05 partial η^2 = 0.33) ; there was a significant main effect of gender on primary school pupils' BST Achievement Test scores in ($F_{(1;275)}$ = 12.03; P< 0.05). The study therefore concluded that collaborative gamification approach is effective in improving primary school pupils' achievement and attitude in BST. Gender has a significant effect on primary school pupils 'achievement in BST. The study however, recommended that Primary school teachers should adopt the use of collaborative gamification most especially while teaching BST Concepts because it has been proven to foster collaboration, critical thinking, and creativity among pupils.

Keywords: Collaborative gamification, Gamification, Achievement, Attitude, Sustainable development, Primary Education, Basic Science and Technology (BST)

***Word Count**: 250*

Introduction

Primary education serves as an initial stage of formal education which provides fundamental knowledge on which all other levels of education are built upon. Primary education predominantly caters for children aged five to twelve years. This phase does more than just introduce academic concepts; it shapes a child's worldview, imbibes core values, and establishes fundamental skills in literacy and numeracy. Additionally, it is in these formative years that students are introduced to basic scientific concepts for the first time, stimulating their natural curiosity and potentially leading to further scientific investigations in later school years. Since primary school lays the groundwork for learning complex concepts, its quality has a significant impact on how effective higher education is (Olaniyan & Obadara, 2008). The foundation laid during primary education plays a crucial role in shaping the quality and capabilities of students as they progress to secondary and tertiary educational levels. As a result, as Famaye,

Akinyemi and Aremu (2020) posited, the effectiveness of advanced education levels is frequently a reflection of the solidity of the primary education. The foundational knowledge and skills acquired during primary schooling significantly influences the outcomes at later educational stages (Amani & Dalal, 2023). In order to provide primary learners with a solid foundation or high-quality education, the National Policy on Education (NPE) highlights three main goals as follows:

1. Establishing a framework for analytical, scientific, and reflective thinking.
2. Improving the child's capacity to adjust to a changing environment.
3. Giving kids useful life skills that fit their unique abilities in order to make meaningful contributions to society (NPE, 2013).

However, NPE (2013) mandates the integration of technology at all educational levels in order to facilitate easier and faster teaching and learning. This is in line with the UNESCO Millennium Goal for Sustainable Development on Education (SDG4), which emphasizes ensuring inclusive and equitable quality education for all member states, thereby fostering lifelong learning opportunities for all.

Basic Science and Technology education (BST) is a core subject in primary education curriculum. It comprises of four main core science subjects that are embedded in National Common Entrance Examination (NCEE) and First School Leaving Certificate Examination syllabus (FSLC) of which are Basic Science (BS), Basic Technology (BT), Information Communication Technology (ICT) and Physical and Health Education (PHE). These subjects constitute 50% of questions in those external examinations. Basic Science and Technology forms the bedrock of primary education, thereby serving as a pivotal foundation for nurturing young minds. However, the relevance of the knowledge of Basic Science and Technology within primary education cannot be overstated. These disciplines are more than just a subjects in primary education curriculum; they are vital tools that shape young minds, preparing them for the challenges and opportunities for the future (Nwachukwu & Johnson, 2020). On the other hand, technology offers a glimpse into the practical applications of these scientific concepts, making the learning experience both relevant and engaging. Ramalia and Anwar (2022) affirmed that one of the most impacts of integrating science and technology into primary education is the cultivation of critical thinking, collaboration and problem solving. The teaching of Basic Science and Technology in Nigeria became necessary due to increased national attention towards vocational education and this has helped in reducing ignorance about technology (Sudirman, 2019).

Nevertheless, recent literatures have proven that primary education is faced with several challenges which has hampered the goal and objectives of UNESCO and NPE (2014) on providing equitable and quality education that promotes lifelong learning opportunities for all. These challenges include; shortage of competent and committed teachers (Hayab & Ayoko, 2023), teachers' out of date knowledge on current trends in education (Dibal &Obaje, 2018; Tintore et al., 2020), negative attitude of pupils as a result of ineffective teaching methodology adopted by teachers which fails to capture full engagement of the pupils, leading to a lack of motivation and poor performance among elementary school students in both termly and external examination (Agbogbua et al., 2021; Hainey et al., 2020). In support of this, Hugo and Michael (2012) found in their study that the conventional method of teaching adopted by many teachers, where the teacher is the chief disseminator of information and students are only passive participants has resulted to negative attitude, low engagement and motivation among students towards learning. This "21st-century students are different and so therefore, they want engaging and challenging lessons. Since traditional method of teaching which are often passive and rote- memorization may not cater for learning preferences of today's young learners, therefore it is imperative to incorporate active teaching pedagogies that will cater for learners with diverse learning styles. This active instructional pedagogy when supplemented with traditional method of teaching will foster hands-on –activities, collaboration, critical thinking and creativity among primary school students. In accordance to this, literatures have emphasized that active teaching methodology tends to improve students attitude, engagement, fosters critical thinking and improve academic performance of pupils (Munna & Kalam, 2021; Besa, 2023; Onanwa & Wisdom, 2020).

In recent years, gamification has emerged as an innovative approach to enhance students' engagement and create an immersive learning experience. Gamification can be defined as the application of game design features in non-gaming contexts (Deterding et al., 2011; Schobel et al., 2020). Gamification is the incorporation of game elements such as points, badges, levels, stars and leaderboards in non-gaming environment. Gamification as an instructional pedagogy also means adding elements commonly found in games, such as competition, rewards, challenges and interactive features into a non-game situations to engage and motivate individuals to accomplish certain task effectively (Deterding et al., 2011; Dominguez et al., 2013). This encompasses the process of creating gamely learning environment via the use of game elements like points, badges, stars and levels in the design of learning experiences (Hamari, Koivisto & Sarsa, 2014). These games can be played digital or manual using printed game elements like stars or levels to reward pupils for completing a task correctly. There are different forms or approaches to gamified instruction which can be implemented depending on the learning goals and context, of which are collaborative, individualized, adaptive and social gamified instruction (Jagust et al., 2018).

In the context of education, Game features like challenges, rewards, and group tasks have been teaching tools for a long time. Even though it's a new term, the idea is old. In classroom, using games and game elements in learning is great because they mirror real situations in a fun way and they often tend to engage players so much that they are emotionally immersed in the process of playing the game, thereby enjoying the task and challenges it offers (Codish & Ravid, 2014; Zimmerling et al., 2019; Asigigan et al., 2021). Not to mention, Huang &Soman (2013) found in their study that the use of Gamification instructional approach help instructors to achieve instructional objectives and equally meet the ever changing need of their learners; they concluded that Gamification reduces negative attitude among pupils and helps them learn through trial and error until they have a full grasp of what they are learning, without being embarrassed by the failure. In support to this, Laine, Nygren, Dirin, & Suk, (2016), in their study found that game elements, in conjunction with other interventions embedded in the game, have a positive impact on student learning outcome. For example, Cheong, Cheong & Fillippou (2013), conducted a study evaluating undergraduate students' use of gamified quiz that incorporated leader boards and points as game design elements. Their findings revealed that gamified learning experience have the potential to improve students' grades, enjoyment, and engagement. Additionally, as highlighted by Papadakis and Zaranis, (2018), from their study, learners can effectively monitor and track their learning progress including accumulated points and acquired badges through the utilization of ranking board in a gamified setting.

Furthermore, collaborative gamification, is a strategy that involves the integration of game elements and mechanics into collaborative work processes and tasks to improve engagement, teamwork, and overall performance. However, in this context, collaborative gamification focuses on using game elements such as points, badges, levels, and leaderboards to motivate and incentivize individuals to work together effectively towards achieving a common goal. Rather than applying gamification solely to individual tasks or activities, collaborative gamification emphasizes the collaborative aspect of the work. Literature have identified the importance of collaborative gamified classroom environment, stating that it encourages teamwork, cooperation, and knowledge sharing by rewarding individuals based on their collaborative contributions and achievements (Udeani et al., 2020 ; Gressick &Langston, 2017). Research conducted by Sanchez and Olivares (2011) has shown that collaborative practices in game-based learning environments lead to increased engagement, develop problem-solving abilities and improved cognitive performance among students. However, while the effects of competition and collaboration have been extensively studied in traditional game-based learning environments, there is a lack of research specifically focused on the collaborative gamified learning context among elementary school pupils in Basic Science and Technology.

Notwithstanding, recent literature has substantiated the pivotal role of gender as a significant factor capable of moderating instructional pedagogy, particularly within the domain of gamification. In corroboration with this notion, a study conducted by Tamarin and colleagues (2022) delved into the examination of students' acceptance of gamification in education, incorporating gender as a moderating factor. The investigation revealed a discernible impact of gender on the nexus between

performance expectancy and students' acceptance of gamification. Interestingly, the results unveiled a noteworthy divergence, with female students manifesting significantly higher performance expectancy regarding the acceptance of gamification compared to their male counterparts. This empirical finding aligns with previous research by Hameri et al. (2014), Seaborn and Del (2015) which posited that women exhibit greater interest in gamification and demonstrate heightened engagement in digital environments relative to males.

Empirically, when critically reviewing gamification in an educational context, it becomes evident that there is scarcity of studies examining the effect of collaborative gamification in primary education **despite the pre-existing corpus of research, it is imperative to note that there is a noticeable lack of studies addressing gender as a mediator between achievement and attitudes towards collaborative gamification among primary school students is evident. Therefore, this study assumes paramount significance, aiming to investigate the moderating effect of gender on students' achievement and attitudes in Basic Science and Technology when exposed to a collaborative gamified learning experience**, as well as how different student groups are influenced by such interventions.

This study is based on Andrew Lander's (2015) gamification theory, which explains the complex relationship between gamification components and user behavior. Lander's theory suggests that adding game components to non-gaming contexts can improve learning-related behaviors and attitudes, strengthening the link between instructional design qualities and learning outcomes. The study uses two accidental routes: moderation and mediation, which explain how gamification affects learning or encourages related behavior. The mediator pathway shows how gamification components directly affect user behavior or attitude, while the moderator pathway incorporates external variables such as system design, user characteristics, and instructional content. When well-integrated gaming components are added to educational content, moderation occurs, improving learning outcomes. Lander's goal is to supplement education rather than replace it, and the research uses Landers' gamified theory to understand the impact of gaming components on the attitude and academic performance of pupils in BST.

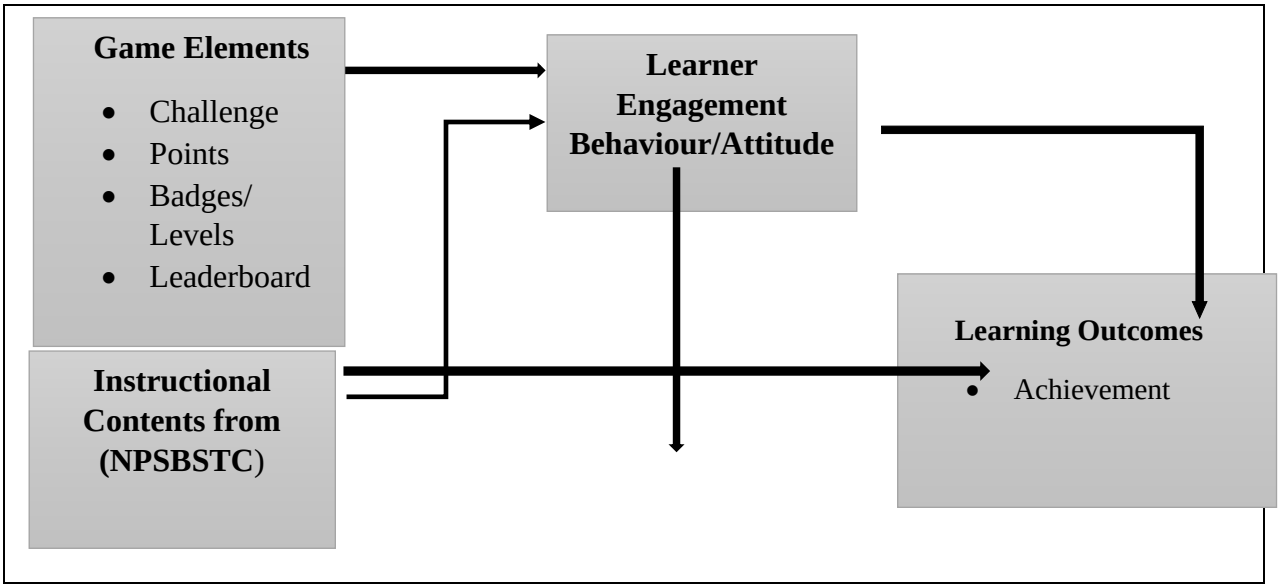

Figure 1. Gamified Learning Environment Adapted from Landers' (2015).

The conceptual framework of the study in figure 1 presents a hypothetical model which shows that the introduction of game attributes into instructional content drawn from the Nigerian Primary School Basic Science and Technology (BST) Curriculum (NPSBSTC) through Anambra State Universal Basic Education Board (ASUBEB), will stimulate the students' learning outcomes (Achievement) and behavior/ attitude towards learning Basic Science and Technology (BST).

Statement of Problem

Primary education serves as the cornerstone of a child's future academic journey, significantly influencing the effectiveness of subsequent educational levels through the foundational knowledge and skills acquired during this phase. In alignment with UNESCO's sustainable development goal and the National Policy on Education (NPE, 2014), there is a concerted emphasis on ensuring inclusive and equitable quality education at all levels, facilitating lifelong learning opportunities.

However, conventional teaching methods may not be sufficient to deliver quality education in the primary education sector, especially in meeting the diverse learning preferences and styles of 21st-century learners. This shortfall impedes student engagement, limits hands-on activities, and hinders the promotion of critical thinking and creativity. Nevertheless, to overcome this challenge, it is imperative to integrate an active instructional pedagogy that not only caters to the varied learning needs but also enhances engagement, critical thinking, collaboration, creativity, and overall student attitude and achievement.

Although researchers have recommended the integration of active pedagogies such as; the use of computer-assisted instruction, gamification, flipped learning approach, and other innovative methods. There is a limited attention on the integration of collaborative gamification most especially in the field of basic science and technology at primary education level..

To address this gap, the study therefore, investigated the impact of collaborative gamification on students' achievement and attitudes towards Basic Science and Technology (BST) concepts, particularly in the context of Onitsha Education Zone. It also recognized the potential moderator influence of gender on the outcomes of gamified instruction.

Objectives of the Study

The main thrust of the study is to determine the effect of implementing a gamification learning strategy on the achievement and attitudes of primary school students towards Basic Science and Technology concepts in Onitsha Education Zone of Anambra State, Nigeria. To achieve this overarching goal, the study will pursue the following specific objectives; to:

i. Assess the current academic level and attitude of primary school students in BST traditional learning setting at Onitsha Education Zone of Anambra State.
ii. Design and implement a collaborative gamified instruction for primary school students in Onitsha Education Zone of Anambra State.

Research Questions

The following research questions are designed to explore the effect of implementing a gamification learning strategy on the achievement and attitudes of primary school students towards Basic Science and Technology concepts in Onitsha Education Zone of Anambra State, Nigeria. While considering the potential moderating factor of gender.

1. What is the level of primary school pupils' (i) achievement (ii) attitudes towards BST?
2. What is the effect of implementing the intervention on pupils' (i) achievement (ii) attitudes in BST?

Hypotheses

The following null hypotheses are formulated to guide the study at 0.05 level of significance:

Ho_1: There is no significant main effect of treatments on pupils':
(i) Achievement in (ii) attitudes towards BST.

Ho_2: There is no significant main effects of gender on pupils':
(i) Achievement (ii) attitudes towards BST.
Ho_3: There is no significant interaction effects of treatment and gender on:
(i) Achievement (ii) attitudes towards Basic Science and Technology.

Methodology

The study adopted a pretest-posttest control group quasi-experimental research design. The population of the study comprised of all the 684 primary four pupils from the three purposively selected schools in Onitsha North Local Government, Anambra State. The criteria for selection are: pupils that were not special pupils (handicapped or disabled), the school must have a regular class and a steady teacher. Two hundred and eighty (280) primary four pupils (132 male) and (148) female were randomly sampled and assigned to the experimental and control group.

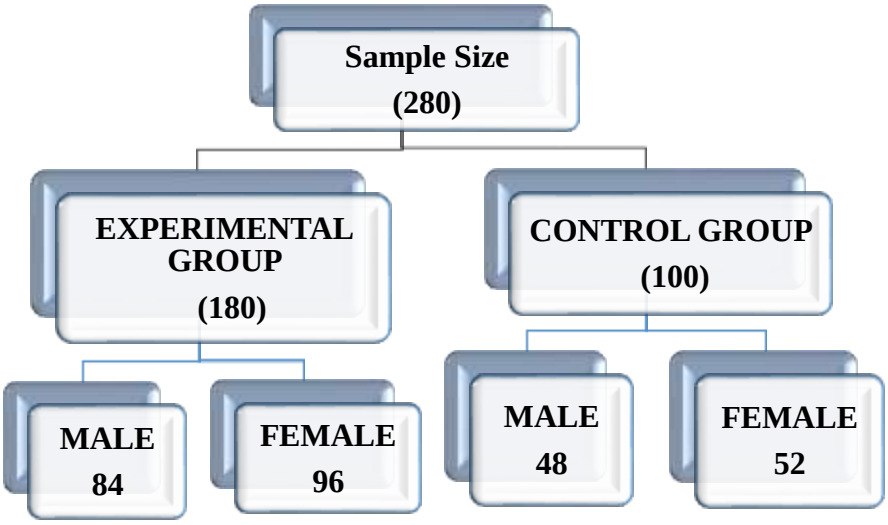

Figure 1: Demographic distribution of samples

Instrument

Eight instruments were used for data collection, four response scales and four stimulus instruments. The instruments are: Basic Science and Technology Achievement Test (BSTAT), Questionnaire on Pupils' Attitude to Basic Science and Technology (QPABST), Collaborative Gamification Instructional Mode Guide (CGIMG), and Conventional Teaching Method Mode Guide (CTMMG). The stimulus instruments were Points, Levels, Stars and Scoreboard. Points were awarded to groups for successfully completing a given task each day during class time. Additionally, levels were awarded to most organized groups at the end of each class. The top-performing groups each week were recognized as "Star Groups" and awarded 5 stars as a means of motivation for all pupils to strive for excellence. Scores were recorded on a scoreboard to allow pupils to track their progress and improvement over time.

Basic Science and Technology Achievement Test (BSTAT) was self-constructed instrument using the test blueprint for BST. The original 50-item test was validated to 40 items after the instrument difficulty and discrimination indices were determined. The 40-item test was trial-tested and the reliability was ascertained using Kuder-Richardson 20 which yielded a value of (r=0.79) which shows that the instrument is reliable enough for the study.

An Attitude Scale Questionnaire was designed to measure pupils' level of engagement, emotion or feelings, knowledge acquired and value they placed on Basic Science and Technology as a subject. The questionnaire comprises of twenty-six (26) items that requires pupils to tick from the four-likert type scale which are: SA (Strongly Agree), A (Agree), D (Disagree), SD (Strongly Disagree). The positively structured statement are to be graded in the following order: Strongly Agree (4), Agree (3), Disagree (2), and Strongly Disagree (1). Section A contains the personal data of respondents' demographic information. While section B consists of 24 items on pupils' attitude towards BST. To ensure that the items in the instrument are consistently reliable, the questionnaire was administered to 30 pupils from another primary schools who were not part of the main study. Cronbach Alpha was used to analyze the data and a reliability coefficient of 0.96 was obtained which indicated that the instrument was consistently reliable.

Procedure for Data Collection

The method of data collection was done in phases below:

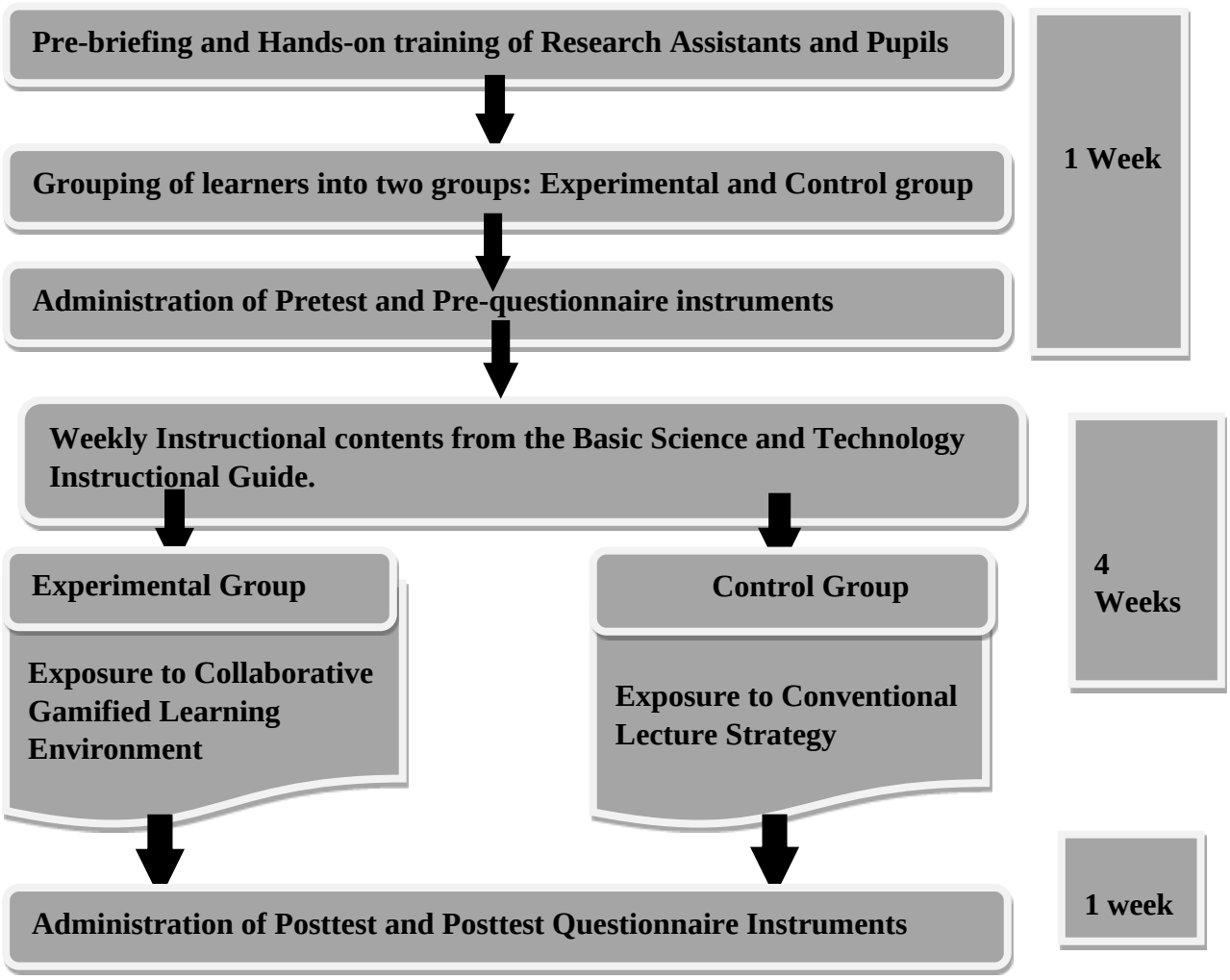

Figure 2. ***A Quasi- Experimental Design Procedure***

The experiment lasted for 6 weeks with the help of two research assistants trained by the researcher. The data collected were analysed using Mean and Standard Deviation and inferential statistics of t-test, and two-ways analysis of covariance (ANCOVA) with the pre-test scores as covariates to test the hypotheses at 0.05

level of significance. Analysis of covariance was used to single out the initial group differences. Also, the Estimated Marginal Means (EMM) of the ANCOVA was used to detect the magnitude and direction of differences.

Results

Answering Research Questions

Research Question 1a: What is the level of primary school pupils' achievement in BST?

This question was answered using mean and standard deviation, which were computed using the achievement scores of pupils before treatment. The results of the analysis are as presented in table 1.

Table 1: Primary school pupils' level of achievement in Basic Science and Technology for both Experimental and Control Groups

Variable	Mean	Std.Dev
Achievement in BST	**29.42**	**11.21**

Table 1 shows that the level of primary school pupils' achievement in Basic science and technology for both experimental and control groups was low as the highest score 58 and the lowest score was 4 after exposing them to 40 items (100%) on BST.

Research Question 1b: What is the level of primary school pupils' attitude in BST?

This question was answered using mean and standard deviation, which were computed using the mean attitude scores of pupils before treatment. The results of the analysis are as presented in table 2.

Table 2: Primary school pupils' attitude towards Basic Science and Technology

Variable	Mean	Std.Dev
Attitude towards BST	**2.35**	**0.446**

Table 2 shows that the level of primary school pupils' attitude to Basic Science and Technology was positive and moderate.

Research Question 2a: What is the effect of implementing the intervention on pupils' achievement in BST?

This question was answered using mean and standard deviation, which were computed using the scores of pupils in the experimental group before and after the treatment. The results of the analysis are as presented in table 3

Table 3: Mean on the performance before and after using Collaborative gamification

Mode of test	N	Mean	SD	Gained Mean
Post-test	**180**	**54.75**	**15.50**	
				23.87
Pre-test	**180**	**30.88**	**10.64**	

Results in table 3 show that the mean scores of primary school pupils before and after exposing them to collaborative gamification are 30.88 and 54.75 respectively. And it can be seen that the mean score of pupils after exposing them to collaborative gamification increased, as the gained mean = 23.87. Thus, using collaborative gamification has positive effect on the primary school pupils' achievement in BST.

Research Question 2b: What is the effect of implementing the intervention on pupils' attitudes towards BST?

This question was answered using mean and standard deviation, which were computed using the attitude mean scores of primary school pupils in the experimental group before and after the treatment. The results of the analysis are as presented in table 4.

Table 4: Mean on the attitude before and after using Collaborative gamification

Mode of test	N	Mean	SD	Weighted Mean
Post-Attitude	**180**	**3.47**	**0.482**	
				1.06
Pre-Attitude	**180**	**2.45**	**0.451**	

Results in table 4 show that the attitude mean scores of pupils before and after exposing them to collaborative gamification are 2.45 and 3.47 respectively. And it can be seen that the mean attitude score of pupils after exposing them to collaborative gamification increased with the gained mean of 1.06. Thus, collaborative gamification has positive effect on pupils' attitude towards Basic Science and Technology.

Testing of Null Hypotheses

Hypothesis 1a: There is no significant main effect of treatment on pupils' achievement in BST

Table 5: Analysis of Covariance (ANCOVA) of BST Achievement Test scores by Treatment and Gender

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	26326.454[a]	4	6581.614	31.026	0.000	.311
Intercept	63226.781	1	63226.781	298.058	0.000	.520
Pretest	227.415	1	227.415	1.072	0.301	.004
Main Effect						
Treatment	21613.956	1	21613.956	101.891	*0.000	.270
Gender	2550.873	1	2550.873	12.025	*0.001	.042

Two- way Interaction						
Treatment * Gender	26.182	1	26.182	.123	0.726	.000
Error	58335.488	275	212.129			
Total	730166.000	280				
Corrected Total	84661.943	279				

R Squared = .311 (Adjusted R Squared = .301* Denote significant difference at 0.05 level of sig

Table 5 revealed that there is significant main effect of treatment on primary school pupils' BST Achievement Test scores in ($F_{(1;275)}$ = 101.89; P< 0.05, partial η^2 = 0.27). The effect size is 27.0%. This indicates that 27% of the variation in pupils' achievement is as a result of the significant main effect of the treatment. Thus, hypothesis 1a was therefore rejected. In order to determine the magnitude of the significant main effect across treatment groups, the estimated marginal means of the treatment groups was calculated and the result was presented in Table 5.1

Table 5.1: Estimated Marginal Means for Post-test by Treatment (Control and Experimental group)

Treatment	**Mean**	**Std. Error**	**95% Confidence Interval**	
			Lower Bound	Upper Bound
Control (Conventional Strategy)	36.224	1.471	33.328	39.120
Experimental (Collaborative gamification)	54.753	1.094	52.708	57.017

Table 5.1 revealed that pupils in the Experimental group (collaborative gamification) had the highest adjusted post-BST Achievement Test mean score (54.75) while those in the Control group (Convention Strategy) had the least adjusted post- BST Achievement Test mean scores (36.22).

Hypothesis 1b: There is no significant main effect of treatment on pupils' attitude towards BST

Table 6: Analysis of covariance of Post-Attitude to BST by Treatment and Gender

Source	**Type III Sum of Squares**	**Df**	**Mean Square**	**F**	**Sig.**	**Partial Eta Squared**
Corrected Model	22.064[a]	4	5.516	35.213	0.000	.339
Intercept	91.270	1	91.270	582.636	0.000	.679
PreAttitude	.035	1	.035	.222	0.638	.001
Main Effect						
Treatment	21.622	1	21.622	138.028	*0.000	.334
Gender	.049	1	.049	.310	0.578	.001
Two-way Interaction						
Treatment * Gender	.042	1	.042	.266	0.606	.001
Error	43.079	275	.157			
Total	3052.358	280				
Corrected Total	65.143	279				

R Squared = .339 (Adjusted R Squared = .329) * Denote significant difference at 0.05 level of sig

Table 6 shows that there is significant main effect of treatment on primary school pupils' attitude in ($F_{(1,275)}$ =138.03; p< 0.05, partial η^2 = 0.33). The effect size is 33%. This indicates that 33% of the variation in pupils'

attitude score is as a result of the significant main effect of the treatment. Thus, hypothesis 1b was rejected. Therefore, there is significant main effect of treatment on pupils' attitude towards Basic Science and Technology.

In order to determine the magnitude of the significant main effect across treatment groups, the estimated marginal means of the treatment groups was calculated and the result was presented in Table 7.1

Table 6.1: Estimated Marginal Means for Post-Attitude by Treatment (Control and Experimental group)

Treatment	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Control (Conventional Strategy)	2.889	.040	2.811	2.967
Experimental (Collaborative gamification)	3.474	.030	3.416	3.532

Table 6.1 revealed that the pupils in the Experimental group (Collaborative gamification) had the highest adjusted post-Attitude mean score (3.47) while the Control group (Convention Strategy) had the least adjusted post- Attitude mean scores (2.89).

Hypothesis 2a: There is no significant main effect of gender (male and female) on pupils' achievement in BST

Table 5 revealed that there is significant main effect of gender on primary school pupils' BST Achievement Test scores in ($F_{(1;275)} = 12.03$; $P< 0.05$, partial $\eta^2 = 0.04$). The effect size is 4%. This indicates that 4% of the variation in pupils' achievement is as a result of the significant main effect of their gender. Male students significantly outperformed the female students. Thus, hypothesis 2a was rejected. In order to determine the magnitude of the significant main effect across gender groups, the estimated marginal means of the groups was calculated and the result was presented in Table 8

Table 7: Estimated Marginal Means for Post-test by Gender (Male and Female)

Treatment	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Male	48.739	1.322	46.136	51.341
Female	42.348	1.268	39.852	44.844

Table 7 revealed that male pupils had the highest adjusted post-BST Achievement Test mean score (48.74) while female pupils had the least adjusted post- BST Achievement Test mean scores (42.35).

Hypothesis 2b: There is no significant main effect of gender (male and female) on pupils' attitude towards BST

Table 6 shows that there is no significant main effect of gender on pupils' attitude towards Basic Science and Technology ($F_{(1;275)} = 0.31$, $p>.05$, partial $\eta^2 = 0.00$). Thus, hypothesis 2b was not rejected.

Hypothesis 3a: There is no significant interaction effect of treatment and gender on pupils' achievement in BST

Table 5 shows that there is no significant interaction effect of treatment and gender pupils' BST Achievement Test Scores ($F_{(1;275)} = 0.12$, $p>.05$, partial $\eta^2 = 0.009$). Thus, hypothesis 3a was not rejected.

Hypothesis 3b: There is no significant interaction effect of treatment and gender on pupils' attitude towards BST

Table 6 shows that there is no significant interaction effect of treatment and gender on primary school pupils' attitude towards BST ($F_{(1;275)} = 0.27$, $p>.05$, partial $\eta^2 = 0.00$). Thus, hypothesis 3b was not rejected.

DISCUSSION

From the study, the findings revealed that primary school pupils who were taught using collaborative gamification performed better in BST than students that were taught using conventional method. The experiment proved especially the importance of collaborative gamified classroom environment, as it encourages teamwork, cooperation, and knowledge sharing by rewarding individuals based on their collaborative contributions and achievements. (Udeani et al., 2020). The result of this study supports the findings of (Leftheriotis et al., 2017; Tvarozek and Brza, 2014). Their studies found that using gamification in education can increase students' academic achievement, boost their engagement and promote collaboration among students. This supports the findings of Aniekwe (2018), found that game elements like points, stars, levels or badges when incorporated in a classroom learning experiences, increases users' participation, enhance motivation, and learning outcome, learners can also effectively monitor and track their learning progress including accumulated points and acquired badges through the utilization of ranking board in a gamified setting (Papadakis and Zaranis, 2018). This validates the findings of the present study. This reveals that using collaborative gamification enhances student's ability to comprehend as well as helps them understand even the most dreadful subject.

The finding also revealed that using collaborative gamification can influence the attitude of pupils. As significant difference was seen in the attitude of pupils exposed to collaborative gamification and those that were not. This is in support of Yildirim's study (2017). The study found that using game elements showed a positive impact on both achievement and attitudes. Also, the study of (Amparo et al., 2017) revealed improved positive attitudes among pupils exposed to gamification. The main goals of gamification are to improve learning outcomes, boost specific skills and attitudes, increase student involvement, enhanced the learning experience, promote collaboration, enhance positive behaviours, and encourage social interactions among students This implies that when students are fully engaged in any teaching or class activity, it fosters a positive attitude and interest in them towards the subject.

From the study, the findings revealed that both male and female students have positive attitude towards basic science and technology. Although, significant differences were seen in the achievement of male and female pupils in BST. Male pupils performed better than the female.

However, the interaction of treatment and gender had no significant effect on primary school pupils' academic achievement and attitude towards BST. This is in support of the finding of Santana et al. (2016). They conducted a study assessing the performance of female and male students in primary education in Brazil, utilizing gamified technology to evaluate their proficiency. Intriguingly, no significant alterations in student performance in Portuguese were discerned or found. This proves that collaborative gamification promotes pupils' learning outcomes irrespective of their gender which implies that gamification close the achievement and attitude gap between male and female pupils.

Conclusion

The study examined the impact of collaborative gamification on the achievement and attitude of primary school pupils' on Basic Science and Technology (BST) in Onitsha Education Zone of Anambra State. The study also investigated the moderating effect of gender on the achievement and attitude of pupils in Basic Science and Technology (BST). The study adopted a pretest-posttest control group quasi-experimental design with a factorial matrix of 2×2×2. Two groups were randomly assigned to treatment and control group of which the experiment lasted for six weeks. The analysed data showed that:

i. The instructional strategy (collaborative gamification) significantly improved the achievement and attitude of primary school pupils in Basic Science and Technology.
ii. Gender has a significant effect on primary school pupils 'achievement in Basic Science and Technology. Male pupils performed better than the female pupils in BST.
iii. Gender has no effect on the attitude of primary school pupils in Basic Science and Technology.

Recommendation

Based on the findings, this study recommends the following:

i. Primary school teachers should adopt the use of collaborative gamification most especially while teaching Basic Science and Technology Concepts because it has been proven to foster collaboration, critical thinking, and creativity among pupils.
ii. School administrators should encourage their teachers to adopt collaborative gamification strategy while teaching other subjects.
iii. Curriculum planners should use the information provided in this research as a guide for subsequent planning of Basic Science and Technology Curriculum.

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RELATIONSHIP BETWEEN JOB SATISFACTION AND WORK ENVIRONMENT OF LIBRARIANS IN NIGERIAN FEDERAL UNIVERSITY LIBRARIES

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Abstract

This study examines the significant relationship between job satisfaction and job environment of librarians in the Federal University Libraries in Nigeria. Survey research method was adopted using both questionnaires and interview as research instruments for data collection. The findings obtained from the Pearson Product-Moment Correlation results reveal that there is a strong relationship between job satisfaction and work environment of librarians in Federal University Libraries in Nigeria. The results from the interview also indicate that librarians in federal university libraries in Nigeria are generally satisfied with work environment. The paper concludes that if the job satisfaction of librarians is to be completely accomplished consideration must be given to areas that need improvements.

Keyword: Job Satisfaction, Work environment, Library, Federal University, Nigeria,

Introduction

Job satisfaction is the sum of all negative and positive aspects related to the individual's physical and emotional working conditions, the authority, the autonomous usage of this authority, the level of success maintained and the rewards given due to this success, the social status maintained in relation to job, colleagues and administrators. Individual elements did not result to job satisfaction. Job satisfaction could only be mentioned if all these elements exist in place and in harmony (Kaya, 1995). Work environment involves what it takes to make you happy and comfortable in your working environment so that you can be motivated to perform your job efficiently. This includes the conglomeration of the following dimension: co-workers, job itself, supervision, operation procedure and communication.

The effect of work environment on satisfaction of workers cannot be over-emphasized in an organization as Gliem and Gliem (2001) report that even if salary, benefits and the opportunities for growth are at an acceptable level, a worker's perception of the work situation may affect the perceived level of job satisfaction. Furthermore, individual perception of the work environment may be affected by interpersonal relationships with coworkers, perceptions of multiculturalism, internal motivation, involvement in decision-making, and perceptions of the physical work environment. In addition, Musoke (2007) observes that satisfaction with coworkers has a positive relationship with internal work motivation and general job satisfaction. He, therefore, concluded that it is necessary for administrators of any organisation to monitor if minority staff perceives bias or discrimination in their works.

The effect of environment in which people work, level of pride for themselves and the work they are doing cannot be overemphasized. It is therefore, important to do everything possible to keep equipment and facilities up to date. Overcrowding should be avoided as to allow each employee his or her own personal space and provision of a desk, a locker or even just a drawer. If you place your workers in close quarters with little or no personal space, it may likely generate tension among them (Syptak et al 1999).

Oshwald (2000) asserts that favourable working conditions are the employee's high priority apart from competitive wages and fringe benefits that is just the first step of attraction to employees in an operation.

An operation that takes the employees so many hours, six or seven days per week may be harder to retain or bear because, according to him, employees are willing to accept low wages in order to work in better environments. It is therefore, important for the employers to consider certain trade off which may include hiring an additional employee which may be well worth the cost of the investment; reducing hours worked weekly and providing more weekend time off.

These reduced hours worked per week must not be construed with overtime; the overtime work must be separately compensated. These types of strategic expenditures will help to attract top-notch employees and improve retention rates. The employee, on the other hand, should show a sense of patriotism by attending to work promptly because any discrepancy found when comparing the hours the employee is expected to work and the hours he reported to have worked will not go well with the employee and employer. This is because it has negated the agreement between them.

In another development, Thornton (2000) examines the job satisfaction of librarians of African descent. He found out that there was no significant gain in the number of librarians of African descent in Academic and Research Libraries (ARL) in the past ten years. It is therefore, suggested that, it is highly necessary responses are created to attract and enhance the job satisfaction of not only librarians of African descent, but librarians from various parts of the world. This is so because, the environment where one works is very crucial in determining one's satisfaction as this needs to do with friendliness and hostility which a worker encounters in the organization where he works.

Nkereuwem (1990) examines theories on job satisfaction and work environment in libraries. The analysis of data from a survey of Nigerian librarians indicated that some of the theories are irrelevant in that context because survey respondents agreed that their level of job satisfaction is directly determined by an amount of money they earn.

Methodology

Survey method was employed using qualitative and quantitative techniques. The suitability of this technique is that it involves a systematic and comprehensive collection of information about opinions attitudes, feelings, beliefs and behaviours of population through observation, interview or administration of questionnaires to a relatively large and representative sample of the population of interest (Aina, 2002).

Population, Sample and Sampling Procedure

Librarians working in Nigerian Federal University libraries with at least Bachelor degree in library and information science are the population for this study. There are 36 Federal Universities in Nigeria. According to Schutt (2006) population is the entire set of individuals or other entities to which study findings are generalized. Therefore, the population of librarians in each university library was estimated to be 20 librarians given the total population of about five hindered and fifty (720) librarians.

Sampling is the unit selected from the population of interest. This allows the researcher to make inferences about the population of interest (Aina, 2002). Stratified random sampling technique was used to obtain sample size and select respondents for the study. The population was stratified into six geo-political zones, i.e. North West, North East, and North Central. Others include South West, South East and South South.

The librarians from the three Federal University Libraries selected from each of the geo-political zones were considered as sample size. At least twenty (20) librarians in each of the sampled Federal University Library constitute a total population of the librarians of the eighteen (18) sampled Federal University Libraries with a total number to be three hundred and sixty librarians as sample size (360)

Data Collection Method

The researcher collected data from the participants through self-administered questionnaires and with a one-to-one semi-structured interview to augment and strengthen the data obtained from the survey questionnaires (Creswell, 2008**).** Three hundred and sixty (360) respondents comprising librarians working in Nigerian Federal University libraries across the six geo-political zones in Nigeria were sampled for this study. Two hundred and fifty one (251) responses, representing 69.72% of the total questionnaires administered, were received. These questionnaires were collated and analysed according to respondents' responses using a 5-points Likert scale rating; 5 for most favourable and 1 for the least favourable. All analyses were carried out using SPSS software package (version 19.0).

Data Analysis and Results

The first part of the results describes the findings from variables on work environment. The second part provides an inferential statistical analysis of the variables used in the study with the use of Pearson Product-Moment Correlation to investigate the relationship between job satisfaction and work environment.

Descriptive Analysis

Before the description of variables, it is integrally essential to make a distinction between the two different levels of responses obtained from the respondents. The number of respondents and percentages on a 5-point Likert scale of '*Strongly Agreed'* and '*Agreed'* are collapsed together. Likewise, the number of respondents and percentage of 'S*trongly Disagreed'* and 'D*isagreed'* are computed together. The purpose of doing that is to enable the researcher to make a clear distinction between the two distinct levels of the responses obtained from the data collected. The last option in the instrument is *Neutral* where respondents maintained their stance.

Results

Co-Workers

This is the relationship of a librarian with other members of staff (that is, colleagues he working with in the University Library. It is a construct of work environment. Table 1 below summaries the respondents' opinions on the questionnaire items on Co-workers

Table 1

Descriptive Analysis of Co-Workers

N = Number of Participants; SD= Standard Deviation

S/N	Statement	Agreed		Disagreed		Neutral		Means	S/D
		N	%	N	%	N	%		
1	Relationship with other staff is cordial.	241	96	2	0.8	8	3.2	4.37	.589
2	I work harder than required because of the competence of the people I work with	163	64.9	27	10.8	61	24.3	3.66	.895
3	My work is being appreciated by the co-	206	82	7	2.8	38	15.1	3.95	.685

	workers in my department								
4	I prefer to do my work, letting others do theirs	190	75.7	30	12	31	12.4	3.81	.943
5	There is no bickering and fight at work	195	79.7	26	10.4	30	12.0	3.95	.966
6	I am not less efficient than my colleagues are	201	80.9	14	5.6	34	13.5	4.00	.853
7	My co-workers are very stimulating	196	78.1	14	5.6	14	16.3	3.82	.727
8	I motivate my colleague at work	205	89.6	2	0.8	24	9.6	4.14	.618
	Total	**1597**	**646.9**	**122**	**48.8**	**267**	**106.4**	**31.7**	**6.276**
	Total Average Mean	**199.63**	**80.86**	**15.25**	**6.1**	**33.38**	**13.3**	**3.96**	**0.785**

The majority of the respondents (96%) agreed that their relationship with other staffs is cordial; while 0.8% of the respondents disagreed and 3.2% respondents neither agreed nor disagreed. The total average mean score of respondents is M=4.37 with average standard deviation of SD .589. Respondents who agreed to be working harder than required because of the competence of the people they work with are 64.9% as against 10.8% respondents who disagreed, while 24.3% respondents neither agreed nor disagreed. The total average mean score of the respondents' responses is M=5.66 with the average standard deviation of SD.895.

Similarly, the majority of the respondents (82%) agreed that their works are being appreciated by the co-workers, as against 28% respondents who hold the contrary view while 15.1% of the respondents are neutral. Total average mean score of the respondents is M=3.95 with average standard deviation of SD .685. About 75.7% respondents preferred to do their work and let others do theirs, but 12% respondents disagreed with the above notion, while 12.4% respondents neither agreed nor disagreed. The total average mean score of the above statement is M= 3.81 with the average standard deviation SD.943.

Pertaining to the statement**,** that there is no bickering and fights at work, the majority of respondents with 79.7% agreed but 10.4% of them disagreed; while thirty librarians (12.0%) neither agreed nor disagreed. Total average mean score of the above statement is M=3.9 and the average standard deviation is SD.966. The majority of the respondents (80.9%) agreed that they are not less efficient than their colleagues; just only 5.6% respondents disagreed, while 13.5% respondents maintained neutrality. The average mean score in this respect is M=4.00 with the average standard deviation to be SD.853.

About 78.1% of the respondents agreed that their Co-workers are very stimulating as against 5.6% respondents who disagreed, while 16.3% respondents neither agreed nor disagreed. The average mean score for this statement is M=3.83 and the average standard deviation is SD.727. The majority (89.6%) of respondents agreed to motivate their colleagues at work; while 0.8% respondents do not motivate their colleague and 9.6% respondents neither agreed nor disagreed. The average mean score of the responses to this assertion is M = 4.14 and the average standard deviation is SD.618.

Operation Procedures

It is one of the constructs of work environment. It is a systematic way of carrying out duties or activities in an organization by the librarians in Federal University Libraries in Nigeria; Table 2 presents the opinions of the respondents to questionnaire items on operation procedure.

Table 2

Descriptive Analysis of Operation Procedure

S/N	Statement	Agreed		Disagreed		Neutral		Means	S/D
		N	%	N	%	N	%		
1	Sometime red tape does not incapacitate my performance	130	51.8	31	12.4	90	35.9	3.43	.843
2	I am given opportunity to decide on how to do my job	178	70.9	25	10	48	19.1	3.77	.947
3	In general, I have much say and influence on what goes on in my work group	162	64.5	18	7.2	71	28.3	3.72	.887
4	I work with two or more groups who operate quite differently	133	51.1	48	19.1	67	26.7	3.44	1.027
	Total	603	238.3	122	48.7	276	110	14.36	3.704
	Total average mean	**150.75**	**59.58**	**30.5**	**12.18**	**69**	**27.5**	**3.59**	**0.926**

N = Number of Participants; SD= Standard Deviation

More than half respondents (51.8%) agreed that sometimes red tape does not incapacitate their performance, but 12.4% respondents disagreed; whereas 35.9% respondents neither agreed nor disagreed. The average mean score of the satisfaction of librarian on red tape is M= 3.43, while the average standard deviation is SD.843. Majority (70.9%) of the respondents agreed to have been given opportunity to decide on how to do his/her job; while 10% respondents disagreed and 19.1 % of the respondents maintained neutrality. The average mean score of the above statement is M=3.77 and the average standard deviation is SD.947.

Regarding the statement 'I have much say and influence on what goes on in my work group' was agreed upon by 64.5% respondents, but 7.2% respondents disagreed; while 28.3% of them neither agreed nor disagreed. The average mean score of the statement above is M=3.72 and the average standard deviation is SD.887. Above average (51.1%) of the respondents agreed to the statement 'I work with two or more groups who operate quite differently', but 19.1% respondents disagreed with this statement, while 26.7% of

respondents neither agreed nor disagreed. The average mean score of the respondents responses is M=3.44 with average standard deviation of SD 1.027.

Job itself

Intrinsic interest the librarians in Federal University Libraries in Nigeria vested in their job. The opinions of the respondents to questionnaire items on work itself are presented in the table 3 below.

Table 3

Descriptive Analysis of Job Itself

S/N	Statement	Agreed		Disagreed		Neutral		Means	S/D
		N	%	N	%	N	%		
1	My job is not only challenging and exciting but also gives me personal satisfaction	232	92.5	6	2.4	13	5.2	4.25	.696
2	The job I perform is relevant to my training	219	87.3	11	4.2	21	8.4	4.20	.799
3	I am always eager to come to work each day	214	85.3	5	2.0	32	12.7	4.14	.723
4	I feel close to the people at work	209	83.3	6	2.4	36	14.3	4.06	.699
	Total	**874**	**348.4**	**28**	**11**	**102**	**40.6**	**16.65**	**2.917**
	Total average mean	**218.5**	**87.1**	**7**	**2.75**	**25.5**	**10.15**	**4.163**	**0.729**

N = Number of Participants; SD= Standard Deviation

Majority (92.5%) of the respondents agreed that their job is not only challenging and exciting but gives them personal satisfaction, while 2.4% respondents disagreed and 5.2% respondents neither agreed nor disagreed. Average mean score of the above statement is M=4.25, while average standard deviation is SD .696. 'The job I perform is relevant to my training' was an assertion that was agreed upon by 87.3% respondents, but 4.2% respondents disagreed, while 8.4% respondents neither agreed nor disagreed. The average mean score of the respondents' responses on the relevance of the job they perform with the training they had is M= 4.20 and the average standard deviation is SD.799.

More than four-fifth (85.3%) of the respondents agreed that they are always eager to come to work each day, just only 2.0% respondents disagreed, but 12.7% respondents neither agreed nor disagreed. The average mean score of the responses is M=4.14 while the average standard deviation is SD.723. Respondents that agreed to feeling close to people at work are 83.5%, while 2.4% respondents disagreed, but 14.3% respondents neither agreed nor disagreed. Average mean score of the satisfaction of the respondents as regards to their closeness to other people at work is M=4.06 while the average standard deviation is SD .699.

Supervision

Is a construct of work environment, supervision is the act of making sure that workers (librarians) perform their work correctly in Nigerian University Libraries. Table 4 presents the summary of the opinions of librarians on questionnaire items on supervision.

Table 4

Descriptive Analysis of Supervision

S/N	Statement	Agreed		Disagreed		Neutral		Mean	S/D
		N	%	N	%	N	%		
1	The relationship between my supervisor and I is cordial.	228	90.9	4	1.6	19	7.6	4.21	.663
2	There is a clear understanding of my job responsibilities between my supervisor and I	218	86.9	10	4.0	23	9.2	4.12	.760
3	Supervision by my supervisor helps me to do my work satisfactorily.	197	78.5	19	7.6	35	13.9	3.94	.888
4	I am appreciated by my supervisor for my job accomplishment	203	80.9	15	6.0	33	13.1	3.97	.843
5	My supervisor praises good work	204	81.3	14	5.6	33	13.1	4.04	8.71
6	I have to do things that should be done differently	126	50.2	44	17.5	81	32.3	3.39	971
7	I work under incompatible policies and guidelines	81	33	104	41.5	64	25.6	2.94	-1.175
	Total	**1257**	**344.7**	**210**	**98.2**	**288**	**113.9**	**26.6**	**3.821**
	Total average mean	**179.57**	**49.24**	**30.0**	**14.03**	**41.14**	**16.27**	**3.8**	**.5459**

N = Number of Participants; SD= Standard Deviation

The majority of the respondents (90.9%) agreed that the relationship between them and their supervisors are cordial, but 1.6% respondents disagreed, while 7.6% of respondents are neutral. The average mean score for this statement is M = 4.21 and the average standard deviation is SD .663. Above two-third (86.9%) of the respondents agreed that 'there is a clear understanding of job between them and their supervisor', but 4.0% respondents disagreed, while 9.2% respondents neither agreed nor disagreed. The average mean score

for the above statement is M = 4.12 and the average standard deviation is SD .760. 'My supervisor helps me to do my work satisfactorily' was agreed upon by 78.5% respondents, but 7.6% respondents disagreed, 13.9% neither agreed nor disagreed. The average mean score is M=3.94 and the average standard deviation is SD .888.

About four-fifth (80.9%) of the respondents was appreciated by their supervisors for their job accomplishment, but 6.0% respondents were not appreciated by their supervisor, while 3.1% respondents neither agreed nor disagreed. The average mean score for the respondents' responses in this regard is M=3.97 and the average standard deviation is SD. 843. 'My supervisor praises good work' was agreed upon by 81.3% respondents. On the contrary, 5.6% of them disagreed, while 13.1% respondents neither agreed nor disagreed. The average mean score is M=4.04 and the average standard deviation is SD .871.

Nearly half (50.2%) of the respondents agreed to have to do things that should be done differently but 17.5% respondents disagreed with the above assertion, while 32.3% respondents neither agreed nor disagreed. The average mean score of the respondents' responses is M=3.39 and the average standard deviation is SD .971. 'I work under incompatible polices and guidelines' was agreed upon by 33% respondents, while 41.5% respondents disagreed, but 25.5% respondents neither agreed nor disagreed. The average mean score of the above statement is M = 2.94 and the average standard deviation is SD -1.175.

Communication

This part reports the communication (horizontal or vertical system of passing information among workers in an organization) of librarians in Federal University Libraries in Nigeria. Communication is also a construct of work environment. Table 5 presents the responses from the respondents on the questionnaire items that seek their opinions on communication among the librarians.

Table 5

Descriptive Analysis of Communication

S/N	Statement	Agreed		Disagreed		Neutral		Mean	S/D
		N	%	N	%	N	%		
1	Communication is more vertical than horizontal.	163	66.1	38	25.2	47	18.7	3.65	.994
2	Communication with other staff does flow well.	177	70.5	37	14.8	37	14.7	3.69	.959
3	Being kept informed of the decision made in my unit that impacts my position and responsibility	198	78.8	8	3.2	45	17.9	3.88	.665
4	Expert opinions are sometimes sought for our improvement of operations and services	194	77.3	16	6.4	41	16.3	3.91	.797
5	I am being kept informed of the university policy and decisions that affect my job	189	75.3	16	6.4	46	18.3	3.88	.845
6	Being alienated and powerless over the change process	102	40.7	81	32.7	67	26.7	3.11	1.069

Total	**1028**	**408.7**	**196**	**88.7**	**263**	**112.6**	**22.12**	**5.324**
Total average mean	**171.3**	**68.12**	**32.67**	**14.78**	**43.83**	**18.767**	**3.687**	**0.887**

N = Number of Participants; SD= Standard Deviation

Two-third (66.1%) of the respondents consented that communication was more vertical than horizontal in their libraries, but 25.2% respondents disagreed, while 18.7% of them neither agreed nor disagreed. The average mean score of the responses to the above assertion is M=3.65 and the average standard deviation is SD.994 'Communication with other staff does flow well' was agreed to by 70.5% respondents, but 14.8% of them disagreed, while 14.7% respondents neither agreed nor disagreed. The average mean score of the respondents' responses to this regard is M=3.69 and the average standard deviation is SD .959.

The majority of the respondents (78.8%) were being kept informed of the decision made in their unit which impacts their position and responsibility, but 3.2% respondents disagreed on the notion, while 17.9% respondents neither agreed nor disagreed. The average mean score is M=3.88 and the average standard deviation is SD.66. The statement 'expert opinions are sometimes sought for the improvement of operations and services' was agreed-upon by 77.3% of the respondents. On the contrary, 16, (6.4%) of them disagreed, while 16.3% neither agreed nor disagreed. The average mean score is M =3.91 and the average standard deviation is SD .797.

More than two-third (75.3%) of the respondents agreed to be kept informed of the university policy and decision that affect their jobs, but 6.4% respondents disagreed, while 18.3% respondents neither agreed nor disagreed. The average mean score of responses as regards the above statement is M=3.88 and the average standard deviation is SD .845. The statement being alienated and powerless over the change process was agreed upon by 40.7% respondents, but 32.7% respondents disagreed, and 26.7% of them neither agreed nor disagreed. The mean score of the responses with respect to the above statement is M=3.11 and the average standard is SD 1.064.

Inferential Statistics

This study presents results of inferential analysis of data. Pearson product-moment correlation as a statistical test was used to determine the relationship among the variables. The benchmark for significant level for the entire test conducted is $P<0.05$

Sample Characteristics

Sample Characteristics comprises of the librarians sampled from eighteen federal university libraries drawn from the six geo-political zones in Nigeria. Table 6 provides the summary of descriptive statistics of the variables used to answer the research questions of the study. This fulfills the condition to satisfy the normality assumption through maximum and minimum of the population sample, mean and standard deviation, skewness and kurtosis.

Table 6

Descriptive Summary Statistics

Operational Variables	Min	Max	Mean	Std Dev	Skewness	Kurtosis
Name of institution	1	18	9.78	5.338	-.043	-1.205
Work environment	2	5	3.9272	.45150	-.725	1.930

Research Question

Is there any significant relationship between job satisfaction and work environment of librarians in Federal University Libraries in Nigeria?

Pearson Product-Moment Correlation coefficient test was conducted to determine the relationship between job satisfaction and work-environment. The analysis presented in table 7 shows a positive relationship between job satisfaction and work environment (r=.653**, n= 251), *P=.000* is less than alpha level .05, implying that a good working environment will enhance job satisfaction of librarians.

Table 7

Correlation Matrix

		Job satisfaction	**Work environment**
Mean		4.1624	3.9272
Standard Deviation		.56239	.45150
Job satisfaction	Pearson Correlation	1	.653**
	Sig. (2-tailed)		.000
Work environment	Pearson Correlation	.653**	1
	Sig. (2-tailed)	.000	

** Correlation is significant at the 0.01 level (2-tailed).

Interview Central Research Question

How does your work environment affect your job satisfaction? What is the influence of work environment on librarian job satisfaction?

Four interview questions were designed for the collection of information from the respondents on the above research question.

Q1: What are your general views about this library working environment?

This interview question was drawn to explore the general feelings and perceptions of the respondents about the environment where they work. The responses noted are as follow: Working environment is conducive; working environment is conducive; Working environment is conducive; Work environment needs improvement; Work environment needs improvement; Work environment is conducive. It can be summarized from the data gotten from the respondents that the working environment is fairly conducive for the librarians in Nigerian Federal University Libraries.

Q2: How would you describe your relationship with your co-workers?

This question was designed to explore the interpersonal relationship among the librarians working in Nigerian Federal University Libraries. Their reactions to the question include: Relationship is warm and cordial; Relationship is warm and cordial; Relationship is cordial and positive; We work together to achieve a common result; Relationship with staff is extremely good; Mutual relationship with staff. From the data

presented above, it can be summarized that the librarians' relationship with the Nigerian Federal Universities is cordial and they work with mutual synergy with one another.

Q3: How do Operation procedures affect your job satisfaction?

The interview question seeks the opinion among the respondents on their perceptions of the effect of the operation procedure on their job satisfaction. The respondents perceived operation procedure as follows: Operation procedures of this library stimulates my job satisfaction; Operation procedure enhances job satisfaction; Operation procedure plays no role in job satisfaction; Operation procedure is poor; lead to reduction in job satisfaction; Operation procedure are moderately okay; Operation procedure is satisfying. It can be summarized that the general operation procedure in the libraries is satisfactory and as such have a positive effect on the satisfaction of librarians in Nigeria.

Q4: How would you describe the flow of communication in this library?

This question was asked in order to explore the communication interactions among the respondents in the Federal University Libraries in Nigeria. Communication is the back-bone of any organization. Any organization without information through communication is dead. The responses of the librarians to the interview question are: I can say the flow of communication in this library is good; Communication flow in this library is both vertical and horizontal. It is good; Communication flows but not very fast from head man down to all; Communication flow is very okay; Communication flows in this library is okay, it goes down to the head of the various units; Communication flow very fast from head man down to all. It can be summarized here that communication flow among the librarians is flexible, horizontal and vertical.

Discussion

Work environment

The result showed that there was a strong positive relationship between job satisfaction and work environment. This reveals that an improvement in the work environment can lead to job satisfaction of librarians in Nigeria. Work environment includes: co-worker, supervision, operation procedure and communication. In support of this finding, Oshwald, (2000) asserted that favourable working conditions are the employees' high priority apart from competitive wages and fringe benefits that is just the first step of attraction to employees in an operation. In support of the above submission, Gliem & Gliem (2001) reported that even if salary, benefits and the opportunities for growth are at an acceptable level; a worker's perception of the work situation may affect the perceived level of job satisfaction.

On the contrary, Aguolu (2007) found no correlation between job satisfaction and work environment. According to him, librarians were not satisfied with work environment; he submitted that librarians working in alienated environment are unlikely to discharge their duties well, which can hamper their productivity below expectation. Leckie & Brett (1997) concluded that adequate assistance from the institution is imperative in creating a work environment that can create and sustain job satisfaction among librarians.

The findings from the interview data are in congruence with the findings derived from the survey questionnaire. This is evident in the interview findings which revealed that the librarians are satisfied with their work environment as expressed by the respondents below:

This university authority really tried their best in terms of providing a conducive working environment and all I can say here is that the work environment of this university library is largely okay and conducive for job performance'.

Anyway, the work environment here in this library to me as a staff here is conducive for improved performance on the side of the staff. But I want the authorities of this library to do more so that we can perform better in our duties'.

The responses above are in consonant that of Kwan (1992) who found a significant relationship between job satisfaction and work environment. The findings also indicate that operation procedure is satisfactory. Since the work environment is conducive, there would be effective operation procedure. This could be supported by some of the respondent's responses.

The operational procedures of this library, hmmm stimulates my job satisfaction to a large extent… it is a vital component of the nature of the job we perform itself'.

In my own view, the operational procedure of this library stimulates my job satisfaction to a large extent. It is one of the reasons why I find happiness with the job I perform here and it is a vital component of the nature of the job itself.

The above findings corroborated the findings of Malliaiah (2009) who reported a moderate level of job satisfaction to operation procedure. The study also shows that there was effective communication among librarians in the Federal University Libraries in Nigerian. This is consistent with the responses of the respondents from the interview conducted.

The flow of communication in this library is exactly the same as what is obtainable in other offices/organization where the practice is a flow of communication from the head (Boss) down to the most junior staff here. Similarly, there is a horizontal flow of communication in this library to ensure that information gets to all staffs of this library. Thus, I can say flow of information in this library is good.

When you talk about the flow of communication, I can tell you here that communication flow in this library is from the head man to the least staff and also, the communication is spread evenly so that it gets to all the staff. Therefore I can tell you that communication flow in this library is both vertical and horizontal, it is good.

Generally, the study found communication in the library to be flexible or satisfactory among librarians. Supporting the above findings, the study by Malliaiah (2009) showed a moderate level of job satisfaction of communication among librarians. But the findings are in sharp contrast with that of Sierpe (2000) which revealed that librarians have low job satisfaction with communication. His study further revealed that there was cordial relationship among the librarians. This is expressed through the respondents' opinions to the interview question with this regards.

The relationship amongst us as staff is cordial and positive. We usually work together as a team to achieve common goals.

My relationship with my co-workers is cordial irrespective of the condition of service. Despite the fact that working condition is not okay here, we still try to do our best and work together as a team. Honestly speaking, we are good friends and colleagues working as a team to achieve a common goal here.

Conclusions

The study investigated the significant relationship between job satisfaction and work environment of librarians in the Federal University Libraries in Nigeria. Data analysis was carried out based on the data obtained from the questionnaires and interviews which were used to assess the level of job satisfaction of librarians in Nigerian Federal University Libraries.

The study revealed that the librarians were satisfied with Operation Procedure, Co-workers, job itself and Communication and fairly satisfied with Supervision. Further study reveals that there was a positive and strong correlation between job satisfaction of librarians and Work Environment. The trend of change in the

library profession with current challenges in information industry requires the staff of libraries to be up to the task and be readily equipped to face challenges. This could be achieved when the librarians are made to be satisfied with their jobs, because successful management of any organisation depends largely on the high morale and satisfaction of its workers. The study, though, contributed to the knowledge based on job satisfaction of librarians in relation to work environment from the Nigerian point of view, the horizon of the literature may have a wider use beyond the context of the Nigerian perspective

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UNDERGRADUATE STUDENTS' PERCEPTIONS TOWARDS BLENDED LEARNING IN MATHEMATICS COURSES

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Abstract

This study aims to explore undergraduate students' perceptions of blended learning in mathematics courses in Ibadan metropolis. The study employed a descriptive design, utilising a sample of one hundred and twenty (120) undergraduates of University of Ibadan in Ibadan metropolis of Oyo State, Nigeria. Four (4) research questions were formulated to guide the study. Data were collected through the use of a questionnaire titled University of Ibadan Undergraduate students' Perceptions of Blended Learning in Mathematics Courses (UIUPBLMC) (r = 0.75). Thirty-four (34) items were placed on a 4-point Likert scale which comprised four sections. Data were analysed, using a simple percentage of the frequency distribution of cross-tabulation analysis. Based on the study findings, it was evident that the perceptions of undergraduate students toward blended learning were generally positive. However, it is important to note that there were some variations in individual perceptions. The participants generally had access to digital tools and found them easy to use. Nonetheless, they encountered certain challenges related to engagement in online forums, high data consumption, and the complexity of the Learning Management System (LMS). Some students found it challenging to navigate and utilise the features of the LMS effectively. It is, therefore, recommended that efforts be made to address technical challenges and ensure equitable access to resources for all students to enhance student engagement and learning outcomes.

Keywords: Perception, Undergraduate students, Blended learning

Introduction

For many years, traditional teaching methods such as worksheets, memorization, repetition, and lecture-style classes have been used in school classrooms with limited success. However, with the advent of technology and the digital revolution, traditional learning methods are being revolutionized. The constant use of traditional methods in teaching and learning is not encouraging in higher institutions because students of today have witnessed a shift in education from a teacher-centred approach to a learner-centred approach through the use of information and communication technology in education, where learning is not restricted to the four walls of the classroom (Veira, Leacock & Warrican, 2014).

In recent years, blended learning has become increasingly popular as educators seek to integrate technology into their teaching practices. Blended learning is an educational approach that combines the use of online educational material and opportunities for online interaction with traditional face-to-face classroom methods. This approach has been shown to have numerous benefits for students, including increased flexibility, personalized learning, and improved engagement (Caha, 2019).

The integration of blended learning in Science and Mathematics education provided students with a more comprehensive and hands-on experience. This approach involves the use of online simulations, virtual labs, games, and videos, which are designed to enhance student engagement and motivation. Blended learning also provides teachers with the flexibility to design tailored learning experiences for students to help them achieve specific learning goals (Horn and Staker, 2015). Teaching Mathematics in an interactive and engaging manner, through problem-solving and games, can facilitate a deeper understanding of the subject matter. According to the National Council of Teachers of Mathematics, Math education should focus on problem-solving, critical thinking, and real-world applications (Falkner, Levi, and Carpenter, 2015).

Although many schools were slow or reluctant to adopt new technologies for some reasons, the COVID-19 pandemic forced all schools and universities to be familiar with blended learning but it was an advantage to schools that had already incorporated blended learning in their academics (Susanti, 2021). According to (Harvey, 2021) 'remote learning' became very common during the COVID-19 pandemic as remote work and remote learning became common practices across the globe. Education and training programs shifted to self-paced e-learning and virtual classrooms, making blended learning the new normal. Post-COVID-19, as learning transitioned back to the physical classroom, the continued adoption of blended learning became evident.

However, the impromptu implementation of blended learning raised various perceptions among students. In a course like Mathematics, students were more comfortable interacting with their peers and the instructor in the face-to-face learning mode and they found that the face-to-face instruction enabled them to learn and understand Mathematics concepts better (Krishnan, 2018). Prior to the COVID-19 pandemic, digital technology use in Mathematics were reported to be inconsistent in quality, quantity and effectiveness (Attard and Holmes, 2020). There were many questions regarding where and how it should be used, and whether its use transformed and improved students' experiences of Mathematics education as some saw it as an educational imperative. Attard and Holmes (2020) argued that students' learning experience in Mathematics can be enhanced through a variety of blended learning approaches by allowing for diverse points of access to learning opportunities if effectively implemented.

The perception of students plays a significant role in determining how well a lesson is taught. As a result, the perception of the students must be taken into account when developing a learning model. Several studies have found that blended learning in the education process offers various advantages such as its utility, ease of use, flexibility, satisfaction, and effectiveness. Nevertheless, other studies have found some disadvantages of blended learning, for instance, the lack of skills in using technology, network problems, and waste of time (Rombe, 2014; Aldosemani Shepherd, and Bolliger, 2019; Sari and Wahyudin, 2019).

A study conducted by Wang et al. (2021) examined students' perceptions of blended learning in a Chinese university. The study found that students had a positive perception of blended learning and appreciated the flexibility and personalised learning opportunities it provided. However, the study also found that students experienced technical difficulties and felt that the quality of online teaching varied. In a study by Park and Bonk (2021), students' perceptions of blended learning were compared between a Korean university and an American university. The study found that Korean students had a more positive perception of blended learning than American students. Korean students appreciated the flexibility and personalised learning opportunities, while American students were more concerned with the quality of online teaching and the lack of social interaction.

The way blended learning is seen by students varies, based on their prior online learning experience, cultural background, and blended learning methodology used. In general, students like the flexibility and chances for personalised learning that blended learning offers, but they also value the social interaction and engagement that come with in-person instruction. When developing and putting into practice blended learning strategies, educators must take into account students' perceptions to improve their learning experiences.

Several researches have looked into how students feel about blended learning in Mathematics classes. The majority of researches have concluded that students favour blended learning and the flexibility it offers. A study by Aggarwal and Gupta (2020) found that most students had a favourable opinion of blended learning. They valued the convenience and adaptability of online learning and said it improved their understanding of mathematical concepts. Also, students claimed that blended learning promoted active learning and assisted them in improving their problem-solving abilities. Similarly, students expressed a positive attitude toward integrated learning in mathematics education, according to König et al. 2020's study. They valued the flexibility of learning at their own pace and the multimedia content. Students also believed that blended learning kept them motivated and interested in their studies. The views of undergraduate students regarding

integrated learning in calculus were examined in a study by Xie, Kim, and Peng (2017). According to the survey, students believed blended learning to be more efficient than conventional face-to-face instruction and had a good attitude towards it.

According to several researches, students believe that blended learning is more dynamic and interesting than traditional teaching methods (Ng, 2017; Saxena, 2016). Students' perceptions of blended learning can be improved, and the learning environment can become more interactive thanks to online resources like interactive simulations. The usefulness of blended learning for the teaching of Mathematics, however, has been the subject of conflicting results in other studies. According to a Jones et al. (2018) study, students' experiences with blended learning were generally good, but there was no discernible difference in their arithmetic abilities between the mixed and traditional classroom settings. In addition, while undergraduate students assessed blended learning favourably, their level of Math self-efficacy did not significantly increase, according to a study by Kim (2012).

Nazir and Rahman (2021) evaluated the efficacy of blended learning in teaching undergraduate students' mathematics in their study. According to the study's findings, children who experienced blended learning performed much better on math tests than those who solely got traditional classroom instruction. The authors of the study by Wang et al. (2020) evaluated how Chinese undergraduate students felt about blended learning. The study's conclusions showed that students believed blended learning to be superior to traditional classroom learning as a way to learn mathematics. Similar to this, Attard et al. (2018) study evaluated undergraduate mathematics students' attitudes toward blended learning. The findings indicated that the majority of students valued the freedom and independence that blended learning provided for their study of mathematics. Moreover, Chen and Weng (2019) looked at the connection between undergraduate students' academic accomplishment and blended learning in their study. According to the results, blended learning significantly and favourably impacted students' academic ability in mathematics. The specific objective of this study was, therefore, to examine the perceptions of undergraduates in the University of Ibadan towards blended learning and its utilisation in Mathematics courses.

Research Question

1: What is the perception of undergraduate students towards the use of blended learning?

2: What is the perceived ease of use of blended learning in teaching Mathematics?

3: What is the perceived usefulness of blended learning in teaching Mathematics?

4: How can blended learning be utilised to enhance more positive academic performances in Mathematics?

Methodology

This study employed a qualitative survey research design as the most suitable approach to collect accurate information that effectively describes the existing phenomena. Through careful data observation, the study examined the University of Ibadan undergraduate's perceptions of blended learning in Mathematics courses in Ibadan metropolis, Oyo State. The target population for this study comprised undergraduates from the Faculty of Science, Faculty of Technology, and Faculty of Education at the University of Ibadan. Specifically, the study focused on students who took Mathematics courses during and after the COVID-19 pandemic. The simple random sampling technique was used to select students from the Faculty of Science, Faculty of Technology and Faculty of Education with a total of one hundred and twenty (120) participants.

Questionnaire on University of Ibadan Undergraduates' Perceptions of Blended Learning in Mathematics courses (UIUPBLMC) (*r = 0.75)* used as the main instrument for data collection. The questionnaire was centred on the perception of students on the use of blended learning in Mathematics courses in three faculties (Faculty of Science, Faculty of Technology and Faculty of Education) in University of Ibadan, Ibadan metropolis, Oyo State. To score the questionnaire, Likert scale type questions were made to measure on a four-point scale using the following: SA= Strongly Agreed, A= Agreed, D= Disagreed, SD= Strongly Disagreed. Aside from the demographic information, the questionnaire contained four subscales. Data were analysed using descriptive statistics such as frequency distribution tables, percentages, mean and standard deviation.

Results

Research question 1: What is the perception of undergraduates towards the use of blended learning?

Table 1: Undergraduate students' perceptions towards blended learning

Items	**Mean**	**Std.D**
I had used technology very well in the past and so the introduction of e-learning did not pose a problem for me	3.2833	0.688
Easy access to varieties of online materials helped me learn at my own pace	3.2500	0.568
Apart from mathematical skills, I got exposed to other skills like reading skills, creative skills, learning skills, communication skills via the e-learning platforms	3.0583	0.714
Poor internet connection and limited access to basic online resources made me fall back on some basic instructions, thereby making me lose interest in the course	3.0333	0.743
I preferred the use of physical materials to using materials online as they seemed boring and I got distracted easily	2.9917	0.814
Visual illustrations of mathematical concepts enhanced my understanding of the course	2.9833	0.777
The fact that my lecturer had difficulty in handling these platforms effectively discouraged me from learning further	2.7667	0.806
My engagement with the e-learning platforms such as Telegram, WhatsApp, Zoom, Google classroom amongst others helped me in comprehending mathematical concepts easily	2.4333	0.707
Weighted mean = 2.98 Criterion mean = 2.50		

Research question 2: What is the perceived ease of use of blended learning in teaching Mathematics?

Table 2: Perceived ease of use and usefulness of blended learning tools in teaching mathematics scale

Items	Mean	Std.D
The blended learning platforms (i.e., Zoom, Google classroom, Telegram, etc.) adopted consumed a large amount of my data	3.3250	0.637
I had access to and was able to use digital tools like laptop, smartphone, iPod	3.2583	0.628
I found it easier to take quizzes and submit assignments on the Moodle Learning Management System	2.9167	0.729
I had easy access to materials and I could revisit the quizzes as many times as I wanted	2.8833	0.700
I was unable to engage properly in the online forums during classes. Some teachers were not using it and this affected us as well	2.8250	0.718
The technologies used were useful in helping me learn at my pace	2.8083	0.737
I couldn't get the necessary support from my lecturers during the online classes when I found it difficult to set up the Moodle Learning Management System	2.6500	0.682
I had access to an excellent internet connection	2.6083	0.700
My lecturers aided my use of the various blended learning tools	2.4833	0.767
I found the Learning Management System (LMS) rather too complex to navigate on my own	2.1833	0.609
Grand Mean = 2.7987		
Criterion mean = 2.500		

Research question 3: What is the perceived usefulness of blended learning in teaching Mathematics?

Table 3: Perception of blended learning in the learning of Mathematics

Items	Mean	Std.D
Multimedia resources on the e-learning platforms enriched my learning experience	3.0167	0.593
The use of online communication (i.e., blackboard discussion, chat, email, interactive whiteboard) to foster group collaboration	2.8833	0.747
After the online classes, I spent more time and effort trying to understand the concepts taught	2.8583	0.781
The online assignment and quizzes helped me to prepare for assessment and end of semester exam.	2.7667	0.719

Communicating online with fellow students and the lecturer improved my understanding of the course	2.7083	0.824
I found it difficult to do my assignments properly due to some ambiguous mathematical symbols that I couldn't type	2.5583	0.889
Blended learning improved my mathematics performance in the quizzes, assignments, assessments and end-of-semester exam	2.5333	0.789
Too many materials were uploaded at the same time which caused a distraction for me	2.5333	0.840
I was able to receive help from the lecturer and fellow student through the on-line forum on Moodle	2.5083	0.780
I did not perform well in my tests and exam due to online distractions	2.4667	0.798
Grand Mean = 2.6833		
Criterion Mean = 2.500		

Research question 4: How can blended learning be utilised to enhance more positive academic performances in Mathematics?

Table 4: Factors to be considered in the utilisation of blended learning in enhancing more positive academic performances in Mathematics

	Mean	**Std.D**
Availability of resources	3.5917	0.572
Access to resources	3.5000	0.635
Training & orientation	3.3750	0.745
Administrative support	3.3500	0.657
Peer support	3.0917	0.840
Workshops & Seminars	3.0333	0.907
Grand Mean = 3.3236		

Discussion

Undergraduate Students' Perceptions of Blended Learning

The finding revealed that majority of respondents had prior experience using technology effectively for instructional purposes, implying that their familiarity with technology facilitated their transition to e-learning without significant difficulties. This finding is in line with the finding of Wang et al. (2021) which stated that students had a positive perception of blended learning and appreciated the flexibility and personalised learning opportunities it provided. Similarly, the finding of this study supported that of Shantakumari and Sajith (2015) that students perceived Mathematics courses in blended format made it easy to follow and enhanced their learning. The online content was well-illustrated and easy to understand.

The online activities increased interactions and were well-framed with regard to their objectives and duration.

Therefore, the undergraduate students generally exhibited a positive perception towards blended learning in Mathematics courses. However, there were variations in the extent of this perception, influenced by factors such as technological proficiency, access to online materials, challenges and distractions, lecturer proficiency, and engagement with e-learning platforms.

Perceived Ease of Use of Blended Learning Tools in Mathematics Courses

Access to technology is an important factor influencing student satisfaction, it was discovered that students had easy access to materials through the various digital tool and were able to revisit quizzes as many times as they could which aided their performance. This finding is in line with a study by Means (2019) who found that personalised learning in Mathematics, facilitated by blended approaches, led to significant improvements in student achievement and motivation. Research by Clark (2021) also found that self-paced blended learning models in mathematics led to increased student motivation, higher engagement, and improved outcomes. Students can progress through the curriculum at their own speed, dedicating more time to challenging concepts while accelerating through familiar ones. Also, participants found the Learning Management System (LMS) too ambiguous to navigate independently. This highlights the importance of providing adequate support and training to students in using the LMS effectively to maximise its benefits and minimise potential usability challenges.

Finally, the research suggests that, while participants generally had access to digital tools and perceived the blended learning platforms as consuming data, there were challenges related to engagement in online forums and the complexity of the Learning Management System. Addressing these challenges by improving teacher utilisation of online forums and providing adequate support for navigating the LMS can enhance the perceived ease of use and usefulness of blended learning tools in teaching Mathematics for undergraduate students.

Perceived usefulness of blended learning in mathematics courses

The finding revealed that participants perceived multimedia resources on the e-learning platforms as enriching their learning experience. The inclusion of multimedia elements, such as videos, interactive simulations, and visual aids, in the blended learning approach positively impacted participants' engagement and understanding of mathematical concepts. This is in line with studies, implementing a blended learning strategy increased students' achievement levels in comparison to other strategies (Awodeyi, Akpan and Udo, 2014). Also, as more time was spent allowing students to study the task at their own pace while employing the blended learning strategy, pupils may have benefited from the mediator. As comparison to e-learning or face-to-face instruction alone, blended learning can promote students' learning more successfully, according to Al-Quhtani and Higgins (2012).

Likewise, participants acknowledged the use of online communication tools, such as blackboard discussion, chat, e-mail, and interactive whiteboard, to foster group collaboration suggesting that the potential of these tools in facilitating effective communication and collaboration among students, allowing for discussions, sharing of ideas, and peer learning, contributed to enhanced learning outcomes in mathematics. This revealed that collaborative blended learning environments in Mathematics enhanced students' critical thinking skills, mathematical communication, and ability to explain their reasoning.

Additionally, participants expressed concerns about online distractions and the overwhelming number of materials uploaded simultaneously, resulting in reduced focus and concentration. Research has shown that student motivation and engagement play a significant role in student success in mathematics education (Schoenfeld, 2013). This therefore emphasises the importance of organising and structuring the learning materials in an engaging and accessible manner, as well as promoting strategies to minimise online distractions and optimise the usefulness of blended learning in Mathematics education.

Utilisation of blended learning in enhancing more positive academic performances in Mathematics

The finding revealed that factors such as the availability and access to resources, training and orientation, and administrative support are crucial considerations in the utilisation of blended learning to enhance more positive academic performances in Mathematics. Providing students with a rich array of resources, ensuring convenient access to these resources, offering adequate training and orientation to both educators and students, and providing administrative support can significantly contribute to creating an effective and supportive blended learning environment that fosters positive academic outcomes in mathematics. Additionally, peer support and opportunities for workshops and seminars can further enhance students' engagement, collaboration, and learning experiences in the blended learning context. This is in line with Kerzic, Tomazevic, Aristovnik and Umek (2019) who affirmed the need of for such support as instructors (educators) first use of instructional technology, the friendly, helping hand of support can make the experience easier. Abiodun (2015) also mentioned that peer support can be one of the easiest and most available ways teachers can get help, but it also calls for collaboration with colleagues, where those who know how to work with a particular technology are willing to render the support needed.

Conclusion

In conclusion, this study found that students generally have a positive perception towards blended learning in mathematics courses. The convenience and flexibility offered by blended learning were highly appreciated by participants, allowing them to access course materials and engage in learning activities at their own pace and time. However, several challenges were identified that can impact undergraduates' perceptions and experiences of blended learning. These challenges include internet connectivity, high data consumption, the complexity of the Learning Management System, limited resources, and the need for engaging online materials. Addressing these challenges is crucial for enhancing undergraduates' perceptions and experiences of blended learning, and for creating a more-inclusive and effective educational environment. Providing reliable internet connectivity, reducing data consumption costs, simplifying the Learning Management System, providing adequate resources, and creating engaging online materials can all contribute to improving the blended learning experience for students.

Further research is needed to explore the impact of blended learning on student learning outcomes and to identify best practices for implementation. Additionally, future studies could examine the experiences and perceptions of blended learning among diverse student populations, including students from different socio-economic backgrounds, academic abilities, and cultural backgrounds.

Recommendations

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

1. Infrastructural Development: Investing in reliable internet connectivity and infrastructure, including computer labs, Wi-Fi access points, and multimedia classrooms. This will ensure that both students and instructors can access online materials seamlessly.

2. Teacher Training: Providing comprehensive training programmes for instructors to familiarise them with blended learning pedagogies, effective online teaching strategies, and the use of digital tools. This will help instructors integrate technology effectively into their teaching practices.

3. Peer Interaction: Fostering peer interaction and collaboration through online discussion forums, group projects, and virtual study groups. Encouraging students to engage with one another enhances their learning experience and builds a sense of community in the online environment.

4. Technical Support: Establishing a dedicated technical support team to assist students and instructors with any technical issues they may encounter while using online learning platforms. This support system ensures a smooth learning experience for everyone involved.

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SOCIAL ENVIRONMENT AS A CORRELATE OF ATTITUDE TOWARDS SCHOOLING AMONG SECONDARY SCHOOL STUDENTS IN OSOGBO LOCAL GOVERNMENT AREA OSUN STATE

Imran Adesile Moshood

Abstract

This study investigated the relationship between social environment and attitude towards schooling among secondary school students in Osogbo Local Government Area, Osun State. A descriptive survey research design was adopted. Two hundred (200) respondents randomly selected from four (4) secondary schools constituted the study's sample size. A standardized instrument titled: "Attitude towards Schooling Inventory (ATSI)" was used for data collection. The findings revealed that: Students' attitude towards schooling in Osogbo Local Government Area was positive. The participants felt that peer group exerted much influence on their attitudes towards schooling; they held positive views about the influence of school atmosphere and home environment on attitude towards schooling among secondary school students. Besides, there was a positive significant relationship between social environment and attitude towards schooling among secondary school students in Osogbo Local Government Area. Based on the findings, recommendations were made that: School atmosphere should be peaceful and conducive for more effective teaching and learning activities; Stake-holders in secondary school education should equip schools with basic facilities and qualified teachers that would enhance the learning experiences of their students; and since home environment was found to influence students' attitude towards schooling, parents are encouraged to create a stimulating and supportive home environment for their children.

Keywords: Social environment, Peer group, School climate, Home environment, Attitude towards schooling.

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Introduction

Education is one of the vital instruments for rapid development of any nation. Education is all the means through which a child or youth or adult develops the ability, attitude and other forms of behaviour of positive values (Elujekwute, Shir, Nnome & Elujekwute, 2021). According to Elujekwute (2019), quality education revolves round multiple factors including an effective teaching and learning process, collaborative inputs of the teacher, the school, students, parents and various home environments. Without students, learning institutes have no value. Students are the main reason for the existence of any educational setting. To mould the students into ideal democratic citizens, students must show positive attitude towards schooling.

Attitude can be viewed as individual's feelings, thoughts and predisposition to behave in some particular manner towards some aspects of one's environment. According to Newton and Mwisukha (2009), attitudes are best expressed when individuals make statements about their feelings or opinions about certain objects, issues or things. For example, statements such as: "I do not like going to school; school activities are boring; my teachers hate me in school; amongst others, are expressions disposition towards schooling. In each of these expressions, the attitudes or feelings of the speakers towards schooling are obvious. Hence, one's feelings are generated from one's cognition or knowledge obtained directly or indirectly about the thing or object which the feelings are centered on.

Attitude to schooling consists of the students' self-reported interests and apathy towards school (Domino, 2009; Chen & Howard, 2010). Attitude towards schooling is a general feeling or evaluation about an individual self report on school and its activities. The school is an avenue where students can attain physical and intellectual growth and development. Hence, it is necessary to examine students' attitude towards

schooling so as to determine if it is significant enough to propel them towards achieving educational success. According to findings of the previous studies, students' attitudes towards school subjects can be influenced by the quality of the teacher, the psychosocial climate in the classroom and the organization management of the classroom (Domino, 2009; Chen & Howard, 2010). Students who achieve in schools are usually interested in schooling. Under-achievers seem to exhibit more negative attitudes towards school than average and high achievers. Thus,, attitude is key in student's schooling experiences.

Attitude towards schooling pertains to feelings about school activities in general and the value attached to schooling (Newton & Mwisukha, 2009; Domino, 2009; Chen & Howard, 2010; Adeyemo, 2012). For instance, Newton and Mwisukha (2009) was of the view that a child's attitude is often a more accurate predictor of his or her success in school. Therefore, get to know the students first helps to know the reason behind their attitudes and try to help them.

Attitude may be positive or negative. Suppose an individual has acquired experienced satisfaction about schooling and what school stands for, then his positive experience about the values of schooling will inevitably lead to a positive cognition about it. That is, cognition of merits of schooling. The positive cognition will in turn generate positive feelings or affective about the values that school stands for, which in their turn would manifest in the individual's actions in school, that is to make the very best of his or her school education.

As children start school, they face many challenges, personal challenges occur as children take new identities at school. Children face the challenge to adjust to new academic activities and they need to mix with new and more diverse groups of friends. At school, daily schedule is more structured, with more formal rules. Children are faced with large groups of children of different ages and size and are confronted with the challenge of making new friends. Thus, a child is confronted with the challenge on how to cope with academic activities in the classroom; how to cope with a totally new environment as compared to the former. However, attitude towards schooling largely depends on past experience at home and on children skills and knowledge (Domino, 2009; Chen & Howard, 2010; Adeyemo, 2012; Chukwuemeka, 2013). When children exhibit a range of social skills associated with cooperation, initiating interactions or assertation, and self-control, they are more likely to be easily attracted to school while difficulties are likely to arise when children are non-compliant, disorganized, distractible or anti-social.

Schooling is influenced by a variety of personal and family characteristics and societal trend. It is the interaction of the child's personal characteristics and their experiences that ultimately determines child attitudes towards schooling (Chukwuemeka, 2013; Ilesanmi, 2016; Filade, Bello, Uwaoma, Anwanane & Nwangburuka, 2019). Human beings are exposed to a number of experiences as they interact with other people and the environment in which they live. As a result, they may develop attitude about others or the environment. Attitude greatly influences how one behaves, and it is an issue that may be responsible for people's actions in different situations. Attitudes are important aspects of social function since they summarize past experiences, predict and direct future actions.

Environment refers to all the objects, forces, and conditions in the home which influence the child physically, intellectually and emotionally (Korir & Kipkemboi, 2014; Filade et al., 2019). The environment is the immediate surroundings in which the students find themselves. It is also referred to as the physical and psychological conditions that affect children (Grealish, 2012). A child often sees the parents, siblings and things in their immediate environment as the most significant. Therefore, social environment becomes a significant factor for learning and development of children.

Social environment refers to the interaction between the child and the social elements within the environment. The social elements in one way or the other have some degree of influence on the child's social life and attitude. The growing body of research suggests the importance of social environment as a context for school success, student's relationship, and student's experiences in their neighborhood, school, family and peer group (Collins, 2014; Ilesanmi, 2016; Bergin, 2019; Elujekwute, 2019). These are shown

to influence specific student‘s adaptation outcome associated with attitude to schooling (Domino, 2009; Chen & Howard, 2010; Adeyemo, 2012). Moreover, each of these social environments may affect the individual differently over time. Social environment factors include the neighborhood, school, family and peers (Chen & Howard, 2010; Adeyemo, 2012; Ilesanmi, 2016; Filade et al., 2019). These factors are systems in a student‘s life that influence individual adaptation outcomes associated with success.

Social environment would more likely have a positive influence on social support, physical health, happiness, personal adjustment and self-esteem of a child. For instance, home environment provides for the interaction between the child and the social elements within the environment (Collins, 2014; Khan, Begun & Imad, 2019). Besides, Dore (2019) found that bad gang and deviant behaviour influence students' attitude towards learning, and students from ghetto area found it difficult to go to school. Likewise, Bergin (2019) found that peer group significantly exerts influence on student's attitudes towards schooling in Gboko, Benue State. In order to stimulate a child's learning experiences, the social environment where schools are located should be made conducive to enhance student's attitude towards schooling.

School is another factor of social environment. Positive perceptions of school safety are related to a sense of school connectedness, which are related to student‘s perceptions of being affirmed and valued by adults at school (Chukwuemeka, 2013; Korir & Kipkemboi, 2014). Many researches were conducted to assess the influence of social environment on student's academic performance but only a little study was done on the relationship between social environment and students' attitude towards schooling. Attitude towards schooling is a vital factor that determines how well students are able to persist and cope in their academic pursuits especially in the face of obstacles and challenges. This study seeks to find out the relationship between social environment and attitude towards schooling among secondary school students in Osogbo Local Government Area of Osun State.

Statement of the Problem

Nowadays, due to economic pressure and other pressing demands on the family, most parents do not get much time to be actively involved in the training and nurturing of their wards at home during the critical period of their development. Most times, parents are so occupied with their jobs that there is no time left for their children. Besides, some parents are fond of engaging their children in domestic chores so much that no space is allowed for home self-study. For example, some parents may engage their children on domestic work which may hinder them from being in school when they are supposed to. If the child lives in the neighborhood where other children do not value education, it may affect the child‘s attitude towards schooling because the child may have wrong impressions about school. Child‘s relationship with peers and the school environment may also influence the interest and attitudes of students to schooling. Students who give-up their studies for the mentioned environmental distractions may consequently exhibit negative attitude towards schooling and eventually dropout. There are increasing reports of drop out rate among secondary school students in Osun State.

Therefore, this study aims to investigate extent which social environment components may impinge on student's attitude towards schooling. The study is interested in examining the perceived relationship between social environment and attitude towards schooling among secondary school students in Osogbo Local Government Area, Osun State.

Purpose of the study

The general purpose of this study is to examine the relationship between the social environment and attitude towards schooling among secondary school students in Osogbo Local Government Area of Osun State. Specifically, the study aimed to;

i. determine what are students' attitudes towards schooling in Osogbo Local Government Area of Osun State

ii. find out the influence of peer group on attitude towards schooling among secondary school students in Osogbo Local Government Area of Osun State.

iii. investigate the influence of school atmosphere on attitude towards schooling among secondary school students in Osogbo Local Government Area of Osun State

iv. find out the influence of home environment on attitude towards schooling among secondary school students in Osogbo Local Government Area of Osun State

v. determine if there is significant relationship between social environment and attitude towards schooling among secondary school students in Osogbo Local Government Area of Osun State

Research questions

This study seeks to address the following research questions:

- What are students' attitudes towards schooling in Osogbo Local Government Area of Osun State?
- What is the influence of peer group on attitude towards schooling among secondary school students in Osogbo Local Government Area of Osun State?
- What is the influence of school atmosphere on attitude towards schooling among secondary school students in Osogbo Local Government Area of Osun State?
- What is the influence of home environment on attitude towards schooling among secondary school students in Osogbo Local Government Area of Osun State?
- Is there a significant relationship between social environment and attitude towards schooling among secondary school students in Osogbo Local Government Area of Osun State?

Research Methods

Research Design

Survey research design approach was used for this study. This research design allows researchers to administer a survey/questionnaire to a sample or to the entire population of people to describe the attitudes, opinions, behaviours or characteristics of the population; and allows them to describe trends about responses pattern to questions or hypothesis (Creswell, 2014).

Participants

The population of this study comprised all secondary school students in Osogbo Local Government Area Osun State. Simple random sampling technique was applied to select four secondary schools. The technique was further used to select fifty students from each of the four selected schools. Altogether, two hundred students constituted the sample size of the study.

Research Instrument

This study adopted an instrument titled: "Attitude towards Schooling Inventory (ATSI)'' to measure attitude towards schooling among the respondents of this study. The instrument was developed by the Department of Counsellor Education, University of Ilorin, Ilorin Nigeria. This instrument has two parts. Part "A" consisted of information on respondents' demographic characteristic; and Part "B" comprised 38 items on attitude towards schooling. The instrument was structured on a 4-point scale, ranging from "1"

equals "Strongly Disagree" to "4" equals "Strongly Agree. The influence of social environment was measured with a self-constructed instrument consisting of 10 items.

Validity and Reliability of the Instrument

The author of the ATSI reported that all necessary steps were taken by the Department of Counsellor Education, University of Ilorin, to ensure that the instrument measures what it is supposed to measure. For the second instrument on social environment, effort was made to ensure the instrument measures accurately what is designed to assess. The items generated for this construct were given to experts in the field of test and measurement to ensure the face and content validity of the instrument were well established.

Besides, the author of the ATSI reported a reliability of 0.62 for the instrument. As for the instrument on social environment, the reliability of the instrument was established using a test-retest reliability method. The instrument was administered twice within an interval of two weeks on 20 respondents who were not included in the final study. The two sets of score were correlated using Pearson Product Moment Correlation (PPMC) and a strong relationship was found between the first and the second administration of test. Thus, the instrument is considered reliable.

Procedure for Data Collection

The researchers visited each school to administer the instrument to the respondents. Fifty (50) copies of questionnaire were administered and collected back in each of the four schools.

Data Analysis and Results

a. *Descriptive Analysis of Respondents' Demographic Variables*

Altogether, two hundred (200) secondary school students in Osogbo Local Government Area, Osun State, participated in the study. Details of the frequency and percentage count of each of the variables are presented in table 4.1 below.

Table 4.1: Frequency analysis of respondents' demographic variables

Name of School	**Frequency**	**Percentage (%)**
Anglican Comm. Grammar Sch.	50	25.0
Criterion Model College Kelebe.	50	25.0
Life Epitome College Osogbo	50	25.0
St. Mark's Comm. High School	50	25.0
Total	**200**	**100**
Gender	**Frequency**	**Percentage (%)**
Male	97	48.5
Female	103	51.5
Total	**200**	**100**
Age Range	**Frequency**	**Percentage (%)**
10-12years	68	34.0

13-15years	84	42.0
16-17years	36	18.0
18years old &Above	12	6.0
Total	**200**	**100**
Class Group	**Frequency**	**Percentage (%)**
JSS1-JSS3	136	68.0
SSS1-SS3	64	32.0
TOTAL	**200**	**100**
School Type	**Frequency**	**Percentage (%)**
Public	100	50.0
Private	100	50.0
Total	**200**	**100**

Table 4.1 showed that a total of two hundred (200) students (50 from each school) participated in the study. The table further revealed that males were 48.5% and females were 51.5%, which indicated that both groups were adequately represented. A greater percent of the participants (68%) belonged to JSS1-JSS3 class, and the remaining 32% fell between SSS1-SSS3 class. Besides, a substantial percent of the respondents (42%) were in the age category of 13-15years old. This is followed by 10-12years old (34%), then 16-17years old (18%), and 18years old and above (12%). More so, the participants were equally represented (50% each) from both public and private schools, and all the schools were located in the urban areas.

b. Data Analysis for Research Questions

Research Question 1: What are students' attitudes towards schooling in Osogbo Local Government Area of Osun State?

This question was analyzed using descriptive statistical method. Table 4.2 presents outcomes of data analysis on students' attitudes towards schooling in Osogbo Local Government Area, Osun State.

Table 4.2: Frequency analysis of data on students' attitudes towards schooling in Osogbo Local Government Area, Osun State

	Disagreed		**Agreed**			**Std.**
Items	**N**	**%**	**N**	**%**	**Mean**	**Dev**
I like to go to school everyday	40	20.0	160	80.0	3.2	1.4
I learn important lessons from school	100	50.0	100	50.0	2.6	1.3
My school facilities are adequate for effective learning	100	50.0	100	50.0	2.6	1.2
My school environment is conducive for learning	60	30.0	140	70.0	2.9	1.3

I like to engage in co-curricula activities	50	25.0	150	75.0	3.1	1.3
I like to go to school on time	45	22.5	155	77.5	3.2	1.3
I do not leave school without permission	40	20.0	160	80.0	3.3	1.2
I relate well with my teachers	60	30.0	140	70.0	2.9	1.3
I interact effectively with my school mates	80	40.0	120	60.0	2.6	1.3
My school provide me with the opportunity to develop skills	70	35.0	130	65.0	2.8	1.3
I am happy with my present class	40	20.0	160	80.0	3.2	1.4
I visit my school during the holiday periods	100	50.0	100	50.0	2.6	1.3
School is of immense value to me	100	50.0	100	50.0	2.6	1.2
My teachers give me too much to do in school	140	70.0	60	30.0	2.9	1.3
I like to wear my school uniform	50	25.0	150	75.0	3.1	1.3
I am not bullied by any of my school mates	90	45.0	110	55.0	2.8	1.3
I think going to school is not a waste of time	40	20.0	160	80.0	3.3	1.2
What I learn in school will help me in the future	60	30.0	140	70.0	3.1	1.3
I contribute to class discussion	80	40.0	120	60.0	2.9	1.3
I participate in school debate	90	45.0	110	55.0	2.7	1.3

The results presented on table 4.3 revealed that the students' attitudes towards schooling in Osogbo Local Government Area were very positive. Majority of the participants (80%, 80%, 80%, 77.5%, 75%, 70%, among others) indicated that they would like to go to school everyday; they are happy with their present class; they think going to school is not a waste of time; they do not leave the school premisis without permission; they like to go to school on time; their school environment is conducive for learning; they relate well with their teachers; among others. In other word, the participants have a positive disposition towards their schools and schooling activities. This development may be attributed to the perceived enabling environment created for learning in those schools.

Research Question 2: What is the influence of peer group on attitude towards schooling among secondary school students in Osogbo Local Government Area of Osun State?

This question was analyzed via a descriptive statistical analysis. Table 4.3 presents outcomes of data analysis on the influence of peer group on attitudes toward schooling among secondary school students in Osogbo Local Government Area.

Table 4.3: Frequency analysis of data on influence of peer group on attitude towards schooling among secondary school students in Osogbo Local Government Area

	Disagreed		Agreed			Std.
Items	**N**	**%**	**N**	**%**	**Mean**	**Dev**
My friends encourage me to go to school	80	40.0	120	60.0	3.2	1.3
My friends play a role in enhancing my performance in school	40	20.0	160	80.0	2.9	1.2
My friend serves as a means of motivation at school	60	30.0	140	70.0	2.4	1.3
Poor relationship with school mates often lead to my absent from school	80	40.0	120	60.0	2.6	1.3
My friend's assistance helps to improve my grades	80	40.0	120	60.0	2.8	1.3

Table 4.3 revealed the feelings of participants about the influence of peer group on attitude towards schooling among secondary school students in Osogbo Local Government Area. Majority of the participants were of the views that peers exert much influence on their attitudes towards schooling. For instance, majority of the participants (80%, 70%, 60%, and 60%, respectively) agreed that friends play a role in enhancing their performance in school, friend serves as a means of motivation at school, friends encourage them to go to school, and that friend's assistance helps to improve their grades. Similarly, some reasonable percent (60%) also agreed to the fact that poor relationship with school mates often lead to their absent from school.

4.2.4 Research Question 3: What is the influence of school atmosphere on attitude towards schooling among secondary school students in Osogbo Local Government Area of Osun State?

This question was analyzed with descriptive statistical technique. Table 4.4 presents outcomes of the influence of school atmosphere on attitude towards schooling among secondary school students in Osogbo Local Government Area.

Table 4.4: Frequency analysis of the influence of school atmosphere on attitude towards schooling among secondary school students in Osogbo Local Government Area

	Disagreed		Agreed			Std.
Items	**N**	**%**	**N**	**%**	**Mean**	**Dev**
My going to school is as a result of well-equipped classroom	120	60.0	80	40.0	3.2	1.3
Being punctual in school is as a result of availability of ICT Center	82	41.0	118	59.0	2.7	1.2
Students whose school is located around market find it difficult to be punctual in school	110	55.0	90	45.0	2.4	1.3

My going to school is as a result of conducive library for student to read at any time	65	32.5	135	67.5	2.9	1.3
Student's interest in school is enhanced by quality of teachers who teach core subjects	48	24.0	152	76.0	3.2	1.3

The data analysis on table 4.4 revealed that the participants were positive about the influence of school atmosphere on attitude towards schooling among secondary school students in Osogbo Local Government Area. Majority of the participants (76%) were of the views that student's interest in school is enhanced by quality of teachers who teach core subjects. Besides, another greater percent (67.5%) indicated that their going to school is as a result of the conducive library available for student to read at any time. Yet, some 59% of the respondents felt that their being punctual in school is as a result of availability of ICT Center. Meanwhile, some 55% of the respondents disagreed that students whose school are located around market area find it difficult to be punctual in school. All this point to the fact that the respondents of this study recognized and acknowledged the vital role that the school atmosphere plays in shaping student's attitude towards schooling and learning

Research Question Four: What is the influence of home environment on attitude towards schooling among secondary school students in Osogbo Local Government Area of Osun State?

This question was analyzed using descriptive statistical analysis. Table 4.5 presents outcomes of data analysis on the influence of home environment on attitude towards schooling among secondary school students in Osogbo Local Government Area.

Table 4.5: Frequency analysis of the influence of home environment on attitude towards schooling among secondary school students in Osogbo Local Government Area

	Disagreed		**Agreed**			**Std.**
Items	**N**	**%**	**N**	**%**	**Mean**	**Dev**
Students who walk long distant from home to school usually sleep in the class	57	28.5	143	71.5	3.1	1.3
Student who lives near the market square finds it difficult to go to school	90	45.0	110	55.0	2.6	1.2
Student who lives near a passerby road finds it difficult to study at night	70	35.0	130	65.0	3.0	1.3
Students find it difficult to attend school in an area where education is not valued	65	32.5	135	67.5	2.9	1.3

I love going to school as a result of people motivation	58	29.0	142	71.0	3.2	1.3

Table 4.5 revealed the feelings of participants about the influence of home environment on attitude towards schooling among secondary school students in Osogbo Local Government Area. Majority of the participants were of the views that home environment exerts some influences on attitude towards schooling among secondary school students in the study area. For instance, a substantial percent of the participants (71.5%, 71%, 67.5%, 65% and 55%, respectively) were of the views that: "Students who walk long distant from home to school usually sleep in the class, they love going to school as a result of people motivation, Students find it difficult to attend school in an area where education is not valued, and that Student who lives near the market square finds it difficult to go to school." Hence, home factor especially parent is a force to reckon with in attempt to enhance student's attitudes toward schooling.

Research Question Five: Is there a significant relationship between social environment and attitude towards schooling among secondary school students in Osogbo Local Government Area, Osun State?

To address the fifth research question, a bivariate correlation analysis was conducted. The result of the analysis is presented in table 4.6 below.

Table 4.6: Bivariate correlational analysis between social environment and attitude towards schooling among secondary school students in Osogbo LGA

Variables	1	2
1. social environment	-	0.570
2. attitude towards schooling		-

n=200; ** Correlation is significant at the 0.01 level (2-tailed).

The results as displayed in table 4.6 showed a positive significant relationship between social environment and attitude towards schooling among secondary school students ($r = 0.57$, $p < .05$). This result indicates that the more supportive the social environment components are, the better will be students'' attitudes towards schooling in Osogbo LGA Osun State, and vice-versa with poor and unsupportive social environment components.

Discussion, Conclusion and Recommendations

The main objectives of this research were to determining the attitude of students towards schooling, and finding out the relationship between social environment and attitude towards schooling among secondary school students in Osogbo LGA of Osun State. In line with the above objectives, the following findings were obtained and discussed.

First, it was evidence in the finding for research question one that students' attitudes towards schooling in Osogbo Local Government Area were very positive. Majority of the participants indicated that they like to go to school every day, they are happy with their present class, they think going to school is not a waste of time, they do not leave the school premises without permission, they like to go to school on time,

their school environment is conducive for learning, they relate well with their teachers, among others. These responses showed a positive disposition of the participants towards their schools and schooling activities. This result can be attributed to the perceived enabling environment created for learning in the schools. These findings are consistent with previous studies. Extant findings show that attitudes are best expressed when individuals make statements about their feelings or opinions about certain objects, issues or things (Newton & Mwisukha, 2009; Domino, 2009; Chen & Howard, 2010; Adeyemo, 2012). Students who achieve in schools are usually interested in schooling, while under-achievers seem to exhibit more negative attitudes towards school than average and high achievers (Domino, 2009; Chen & Howard, 2010; Adeyemo, 2012).

Secondly, this study found that the participants were of the views that peer group exerts much influence on their attitudes towards schooling. For instance, majority of the participants agreed that friends play a role in enhancing their performance in school; they serve as a means of motivation at school; they encourage them to go to school; and render assistance to improve their grades. Some reasonable percent also agreed that poor relationship with school mates often lead to their absent from school. This finding equally aligns well with previous studies. The growing body of research suggests the importance of social environment especially friends, family and peer group as determinants of school success, student‘s relationship, and student‘s experiences in their neighborhood, and school (Uba, 2015; Bergin, 2019; Filade et al., 2019; Khan et al., 2019). For instance, Filade et al. (2019) found that peer group significantly affects students' attitude towards schooling. Also, Collins (2014) noted that home condition which includes the family background of a student relates to students attitude towards schooling. Likewise, Dore (2019) found that bad gang and deviant behaviour influence students' attitude towards learning.

The findings for the third research question revealed that participants held positive views about the influence of school atmosphere on attitude towards schooling among secondary school students in Osogbo Local Government Area. For example, majority of the participants were of the views that student's interest in school is enhanced by quality of teachers who teach core subjects, that going to school is as a result of conducive library available for student to read at any time, and they felt that their being punctual in school is as a result of availability of ICT Center. These findings also agree with previous studies. Chukwuemeka (2013) and Elujekwute (2019) opined that school facilities when provided will aid teaching-learning programme and consequently improve student's attitude towards schooling. According to Elujekwute (2019), facilities form one of the potent factors that contribute to student's attitude towards schooling and consequently their academic achievement. These include the school buildings, classroom, accommodation, libraries, laboratories, furniture, recreational equipment, apparatus and other instructional materials. The unattractive school buildings and overcrowded classrooms among others contribute to poor student's attitude towards schooling in secondary school and other levels of education.

The findings regarding the fourth research question revealed that majority of the participants believed that home environment exerts some influences on attitude towards schooling among secondary school students in the study area. A substantial percent of the participants were of the views that "Students who walk long distant from home to school usually sleep in the class, they love going to school as a result of people motivation, Students find it difficult to attend school in an area where education is not valued, and that Student who lives near the market square finds it difficult to go to school." This result depicts the importance of quality home environment in shaping and enhancing children's attitude towards schooling. According to Collins (2014) and Khan et al. (2019), home is a social group of people consisting of a husband, wife and their children. Home environment provides for the interaction between the child and the social elements within the environment (Chukwuemeka, 2013; Ilesanmi, 2016).

Lastly, the finding of this study revealed a positive significant relationship between social environment and attitude towards schooling among secondary school students in Osogbo Local Government Area. This result indicates that the more supportive the social environment components are, the better will be students' attitudes towards schooling in Osogbo LGA, Osun State, and vice-versa with poor and unsupportive social

environment components. Consistent with previous studies, Newton and Mwisukha (2009) found significant relationship between peer influence on attitudes towards school, peer group activities and academic achievement. Bergin's (2019) study also showed a significant correlation between the type of friends and students attitude towards schooling in Gboko Local Government Area of Benue State. Specifically, the peer group exerts significant influence on students' attitude towards schooling. Similarly, Dore (2019) reported that social environment element such as bad gang and deviant behaviour influence students' attitude towards learning.

Conclusion

The study investigated the attitude of students towards schooling, the influence of social environment on attitude towards schooling, as well as the relationship between social environment and attitude towards schooling among secondary school students in Osogbo LGA, Osun State. The participants' attitudes towards schooling were positive. School atmosphere, peer group and home environments were found to exert great influence on students' attitudes towards schooling. Lastly, a positive significant relationship was found between social environment and attitude towards schooling among secondary school students, indicating that the better and supportive the social environment components were, the better would be students' attitudes towards schooling.

Recommendation

Based on the findings discussed above, the following recommendations are made:

(i) School atmosphere should always be peaceful and conducive to enable effective teaching and learning activities. Such environment should be safe, and students should be treated fairly by teachers, so as to facilitate positive attitudes towards schooling among students.

(ii) Stake-holders in secondary school education are urged to equip schools with basic facilities and qualified teaching staff that would enhance the learning experiences of their students. This is necessary for students to develop positive attitudes towards schooling, so as to have a better academic performance in school.

(iii) Since home environment was found to influence students' attitude towards schooling, parents are encouraged to create a stimulating and supportive home environment for their children. They need to motivate their wards on need to see education as the best legacy they can ever inherit from them. .

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GAMIFIED FLIPPED LEARNING STRATEGY: A PEDAGOGICAL INNOVATION FOR TEACHING OF BIOLOGY CONCEPTS AMONG PRE-SERVICE TEACHERS IN ANAMBRA STATE, NIGERIA

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Abstract

The study of biology plays a crucial role in scientific and technology advancement of a nation. To achieve this, it is crucial for students to have a strong grasp of biology concept and develop a positive attitude towards the subject. However, there has been a noticeable setback due to students' negative attitude towards the subject. This study therefore, investigated the effect of gamified flipped learning strategy on the achievement of Invertebrate Zoology concepts among pre-service teachers at College of Education Anambra State, Nigeria. It also examined the moderating effect of gender on the achievement of pre-service teachers in biology. The study adopted a pretest-posttest control group quasi experimental research design of 2×2×2 factorial matrix, with a sample of 150 intact class (68 males and 82 females). The instrument used for data collection were Biology Achievement Test (BAT) with reliability index of (0.79). Experimental group were exposed to Gamified Flipped Instructional Package (GFIP), while control group was exposed to Lecture Method (LM). Mean and standard deviations were used to answer research questions, ANCOVA was used to test hypotheses at 0.05 level of significance. The results revealed that gamified flipped Instructional strategy significantly improved students' academic achievement ($F_{(1,137)} = 145.87$; $P < 0.05$, *partial* $\eta^2 = 0.52$) *towards biology. However, there is no significant main effect of gender on pre-service teachers' achievement* ($F_{(1;\ 137)} = 0.39$, $p > .05$, *partial* $\eta^2 = 0.003$) *in biology. The study concluded that gamified flipped learning strategy is one of the effective instructional approaches to teach biology, particularly, "Invertebrate Zoology" concepts and other science related concepts, because it creates room for collaboration, creativity, critical thinking. It was recommended that educators should adopt such a strategy in teaching biology since it improves students' academic achievement in biology.*

Keywords: Flipped learning Approach, Gamification Approach, Digital Technology Self Proficiency and Invertebrate Zoology**.**

Introduction

Education is an essential component of any country's growth and development. People believed that education is a tool for a country's development and growth. Yet a country's degree of development and advancement is determined by the caliber of its educational system. Because educational service delivery in the nation affects the achievement and development of the country, educators, the government, and other stakeholders in education have focused their emphasis on it. The introduction of technology has improved living standards and had a significant impact on all spheres of society, including the home, workplace, school, and marketplace (Gambari, Ajanaku & Abraham, 2019). As such, the contribution of science and technology education to societal transformation cannot be overstated. Science and technology education is given high priority due to its significant contributions to human life and the progress of nations. According to Baba (2017), a country cannot advance without a solid foundation in science and technology.

The scientific discipline of biology, which is required for many other fields of study including botany, agriculture, medicine, nursing, biotechnology, and other related fields, contributes significantly to a country's technological growth. Biology education in postsecondary and senior secondary education equips

students with useful ideas, theories, and concepts that help them deal with life's obstacles both before and after graduation (Sallau et al., 2019). The basic foundation for comprehending every facet of life on Earth is the study of biology.

However, in recent years, research indicates that students in West Africa are struggling to pass biology subjects at both the West Africa Secondary School Certificate Examination (WASSCE) and Senior School Certificate Examination (NECO). Issues include difficulty answering questions, spelling technical terms, interpreting questions, and having shallow knowledge of the subject. This has led to low scores and poor performance, consistent with a decline in pass rates from 2010 to 2023 statistical analysis (Piwuna and Mangut, 2023; Okanume, 2024).

Furthermore, some biological ideas may be difficult for pre-service teachers to understand because they are abstract or complicated (WAEC Chief Examiners' Report, 2019). Among these classes were "Cell Biology, Invertebrate Zoology, and Genetics (Gambari et al., 2019)". Since these ideas are included in the senior high school curriculum, pre-service teachers should be familiar with them. Pre-service teachers can effectively teach these ideas during their senior secondary school teaching practice activities if they have a good comprehension of them. However, a recent analysis that examined statistical data on students' performance on invertebrate zoology course over a six-year period in a college of education Nsugbe, from 2017 to 2022, revealed a decline in the pass rate (Okanume, 2024).

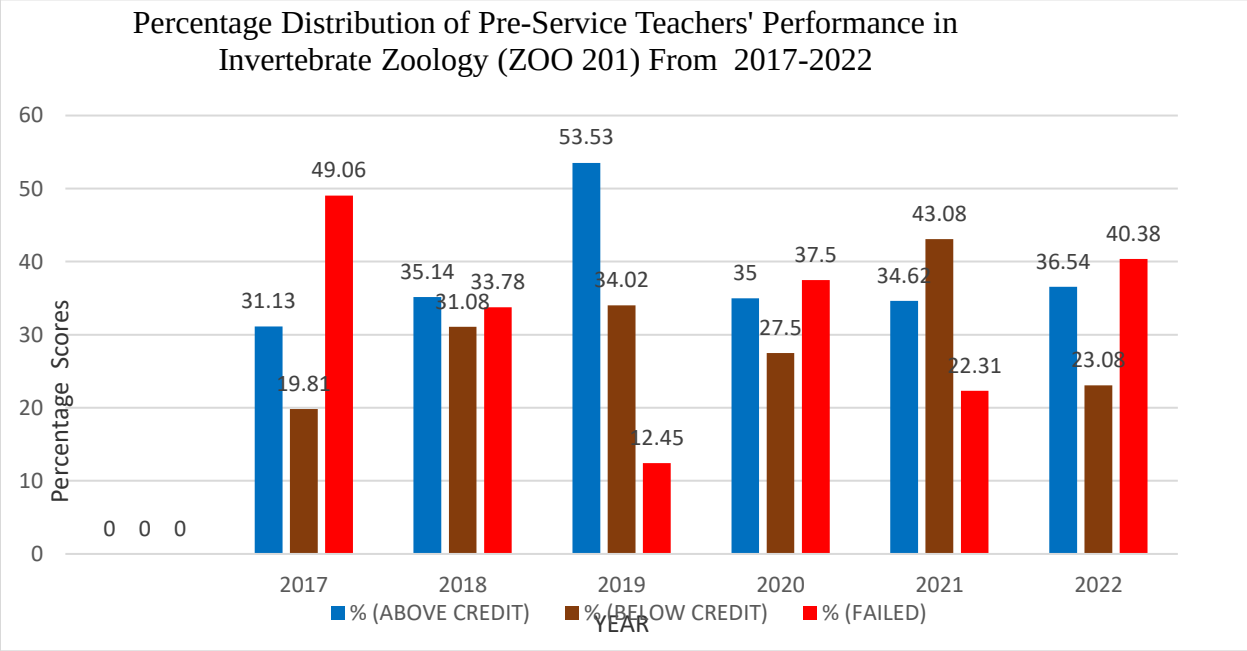

Figure 1: **Statistical Analysis of Students' Performance in Invertebrate Zoology from 2017-2022.**

Source: Exams and Record Section of Department Biology Education, Nwafor Orizu College of Education, Anambra State.

However, the persistent drop in biology student performance can be attributed to negative attitudes developed due to ineffective teaching methods used by biology teachers when teaching complex biological concepts. These methods fail to effectively engage students and aid in understanding basic concepts and principles (Kyado, Abah & Samba, 2019; Nja et al., 2022). Etobro and Fabinu (2017) affirmed that a lack of comprehension of biological ideas can frustrate students and result in poor performance. Literatures have shown that a teacher-centered approach of instruction may also contribute to poor achievement of students

towards biology examinations. Poor teaching methodology and inadequate laboratory equipment can hinder students' understanding and application of biological concepts, leading to frustration during biology lesson (Darling-Hammond, 2017).

However, gender may play significant roles in students 'performance in biology. Gender stereotypes often lead to negative attitudes towards the subject, as male students may view biology as a subject well suited for females (Tambaya & Matazu, 2016). They have formed a negative attitude toward the subject (Ekineh & Adolphus, 2019).

Therefore, incorporating an active teaching strategies that are appropriate for the subject matter and customised to the learning preferences and styles of the students is necessary to address the low performance of pre-service teachers in biology. Nalevska and Kuzmanovska (2020) research found that academic performance increased when the teaching approach was adjusted to the preferred learning styles of the students. Building on this, research has highlighted the use of active teaching pedagogies, which may support students' full participation, creativity, and teamwork (Mai, Yusuf & Saleh 2023). It can also help to modify instruction from a teacher-centered to a student-centered approach, where students will take responsibility for their own learning. Recent literature has highlights the importance of active teaching pedagogies in fostering student engagement, creativity, and collaboration. Researchers have developed innovations like: Blended Learning Approach (Kintu et al., 2017), and Gamification and Game-Based Learning (Gambari et al., 2019; Udeani & Akhigbe, 2020), to improve STEM education performance. However, there is limited attention on incorporating two active instructional pedagogies as a singular entity: (Gamified Flipped strategy), particularly in Invertebrate Zoology concepts of Biology.

In order to increase motivation and engagement, gamification, as an educational strategy, in this context refers to the integration of game-related components like points, stars, ladders, badges, and leaderboards inside a non-gaming setting. This approach seeks to increase or revitalize students' motivation, engagement, and sincere interest in the process of learning (Kapp, 2021; Aniekwe, 2018). This method gives students the chance to actively engage in class activities and gives them incentives like points, stars, or badges in return. Additionally, as noted by Papadakis, Kalogiannakis and Zaranis (2018), students may efficiently track and monitor their progress, including the accumulation of points and badges, through the use of a ranking board.

Gamification has several applications in the field of education. Teachers use gamification a lot to solve problems with student engagement and motivation (Oluwatayo, 2021). However since conventional teaching approaches sometimes find it difficult to hold students' attention, they become less effective and disengaged. In accordance with this notion, Udeani and Akhigbe (2020) discovered in their study that gamification changes standard learning experiences into dynamic, interactive processes that increase students' enjoyment and engagement. Furthermore, Gambari's (2019) study in Nigeria examined the effectiveness of a gamified instructional package on genetic concepts among secondary school students. The study, which involved 90 participants, found that gamified teaching improved students' attitudes and learning outcomes compared to standard lecture training. The findings suggest gamification as a potential educational strategy for biology teaching.

Additionally, Flipped learning is an instructional approach that reverses traditional classroom models by delivering content online or offline, often using pre-recorded videos or text. Students watch videos, read from text, and conduct research at home, prepared for active learning experiences like discussion, peer teaching, presentations, and group-based problem-solving under teacher guidance. The core objective of flipped learning approach is to shift instruction to learner-centered, with teacher-led instruction taking a backseat and active learning taking the forefront. Several empirical investigations on these approaches have been carried out. It has been discovered that this strategy raises achievement, collaboration, creativity and critical thinking skills, particularly in STEM education. The main elements of flipped learning, according

to Yilmaz and Baydas' (2017) research, are shifting the delivery of knowledge outside of the classroom and using class time for more advanced activities. However, they discovered in their research that the flipped learning approach not only greatly increased students' attitude and achievement but also encouraged participation and motivation. Park and Han (2018) compared flipped classrooms with traditional classrooms, highlighting the active participation of students in flipped learning environments. They found that students in flipped learning environments performed better than those in traditional learning environments. Additionally, students from the active learning section received higher grades in subsequent biology courses. The study concluded that using a flipped active learning strategy improved students' performance and attitude in a general biology course at a community college.

Empirically, it is clear from a critical evaluation of flipped learning and gamification in the Classroom that there are few research looking at how gamified flipped instruction affects Invertebrate zoological concepts. It is important to acknowledge that, despite the body of prior research, there is a relatively small number of studies that examine gender as a factor between pre-service teachers' achievement in a gamified flipped classroom. Therefore, the main objective of this study is to provide insight into how gamified flipped instruction may affect pre-service teachers' academic performance regarding Invertebrate Zoology concepts. Additionally, it examined the moderating effect of gender on pre-service teachers' performance in Invertebrate Zoology.

This study is based on Lander's (2015) gamification theory, which was adapted to explain the relationship between gamification elements (points, badges and stars), learners' engagement/ behaviour and achievement. Lander's theory suggests that adding game components to non-gaming contexts can improve learning-related behaviors and attitudes, strengthening the link between instructional design qualities and learning outcomes. The study uses two accidental routes: moderation and mediation, which explain how gamification affects learning or encourages related behavior. The mediator pathway shows how gamification components directly affect user behavior or attitude, while the moderator pathway incorporates external variables such as system design, user characteristics, and instructional content. When well-integrated gaming components are added to educational content, moderation occurs, improving learning outcomes. Lander's (2015) however, clarified that the goal of gamification is to supplement instruction and not to replace it. The gamification of instructional content cannot enhance learning if the instructional content itself does not have the capacity to improve students' learning most especially their attitudes and engagement. Based on this submission, Lander gave a critique of previous studies on gamification which have failed to explicitly measure the behaviour/ attitudes of students which are the direct consequence of gamification. Thus, the introduction of gamification in education is not to replace instruction rather, to supplement it.

Therefore, this study uses Landers' gamified theory to understand the impact of gaming components on the attitude and academic performance of pre-service teachers in Invertebrate Zoology concept.

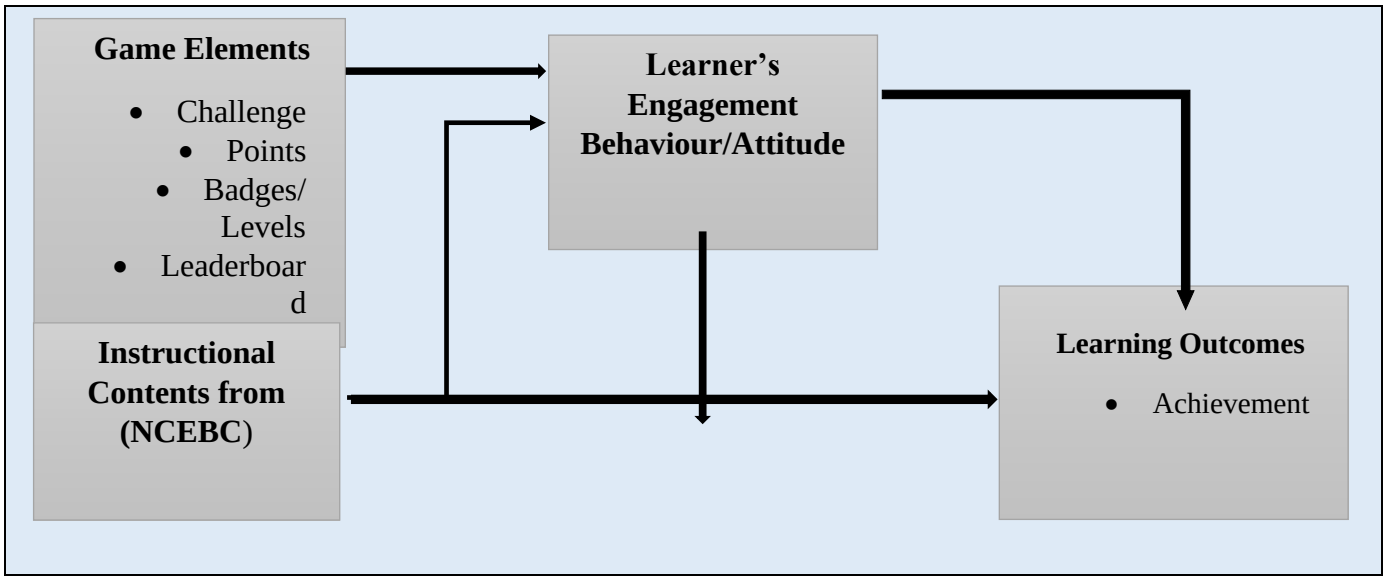

Figure 1. Gamified Learning Environment Adapted from Landers' (2015).

The conceptual framework of the study in figure 1 presents a hypothetical model which shows that the introduction of game attributes into instructional content drawn from the Nigerian College of Education Biology Curriculum (NCEBC) through Teacher Training College, Anambra State, will stimulate the students' learning behaviour which will in turn, improve their learning outcomes (Achievement) towards learning Invertebrate Zoology concept.

Statement of Problems

The study of biology plays a vital role in a nation's scientific and technological advancement. To achieve this, it is crucial for students to have a strong grasp of biology concepts and develop a positive attitude towards the subject. However, there has been a noticeable setback due to students' negative attitudes towards biology. This has resulted to poor academic performance in both internal and external examinations.

Gender differences have also influenced the effectiveness of instructional strategies employed by researchers to enhance students' attitude and academic performance in biology. This is because some students may lack full motivation and engagement in such pedagogical approaches.

Although researchers have recommended incorporating active pedagogy, hands-on –activities, and interactive learning strategies such as gamification approach, use of blended learning approach, flipped learning approach, use of video- assisted learning and others, in order to enhance students' participation, attitude, motivation and performance and as well cultivates good use of time spent in biology classroom. However, there is a limited attention on the combination of two active instructional pedagogies such as gamification and flipped learning approach as a single instructional approach most especially in the field of biology particularly in invertebrate zoology course.

Therefore, this study aims to explore the effect of Gamified Flipped learning strategy on the achievement towards Invertebrate Zoology concepts among pre-service teachers at Nsugbe, Anambra State. It also seeks to examine the moderating effect of gender on students' achievement in biology

Research Questions

The following research questions were answered in the study:

1. What is the effect of implementing the intervention on achievement towards pre-service teachers in biology?
2. Is there any difference in achievement between male and female pre-service teachers after intervention?

Hypotheses

The following null hypotheses are formulated and tested.

1. There is no significant main effects of treatment on pre-service teachers 'achievement in biology.
2. There is no significant main effects of gender on pre-service teachers' achievement in biology.
3. There is no significant two-way interaction effect of treatment and gender on pre-service teachers' achievement in biology.

Methodology

The study adopted a pretest-posttest control group quasi-experimental research design. The target population of this study comprised of all the two hundred level (200 level) pre-service teachers offering Invertebrate Zoology (ZOO 201) at College of Education, Nsugbe which formed a sample size of one hundred and fifty (150) intact class of pre-service teachers. They were purposively selected on the criteria that: they were not yet preparing for external exercise such as teaching practice, and they were judged to be matured enough to effectively collaborate. The students were further randomly assigned to treatment and control group.

Seven instruments were used for data collection, four response scales and four stimulus instruments. The instruments are: Biology Achievement Test (BAT), Gamified Flipped Instructional Package (GFIP), Gamified Flipped Instructional Mode Guide (GFIMG), and Conventional Teaching Method Mode Guide (CTMMG). The stimulus instruments were Points, Levels, Stars and Scoreboard. Points were awarded to groups for successfully completing a given task each day during class time. Additionally, levels were awarded to most organized groups at the end of each class. The top-performing groups each week were recognized as "Star Groups" and awarded 5 stars as a means of motivation for all students to strive for excellence. Scores were recorded on a scoreboard to allow pupils to track their progress and improvement over time.

Biology Achievement Test (BAT) was a multiple choice self-constructed instrument used to measure the level of students' knowledge of selected Invertebrate Zoology concepts based on six levels of cognition according to Bloom's taxonomy of Cognitive Skills (Bloom 1956). The original 55 test-items was validated to 50 items after the instrument difficulty and discrimination indices were determined. The 50 test-items was trial-tested and the reliability was ascertained using Kuder-Richardson 20 which yielded a value of (r=0.79) which shows that the instrument is reliable enough for the study.

The Gamified Flipped Instructional Package (GFIP) validated by three experts from Educational Technology was developed using PowerPoint, Camtasia application (360), Google form for online quizzing. It contains multimedia elements like animated images, sounds (audio), and videos. In order to save cost on the side of the students, the package was sent to the students in experimental group using data saving application (Bluetooth and Xender) before and after each class time. Thereafter, links were sent to students through the delivery platform (WhatsApp) for them to access their quiz online using Google Form after interacting with the instructional content at home.

Procedure for Data Collection

The study was carried out in a College of Education, Anambra. Firstly, approval was sought from the Head of Department of Biology Education, and the lecturer in charge of the course (Invertebrate Zoology). They were briefed on the purpose of the research in order to get correct responses without influence and bias in their opinion. The research ethics guiding the confidentiality of the respondents' data were highly maintained. The experiment lasted for 7 weeks with the help of three research assistants trained by the researcher. The procedure for data collection was done in phases using the chart which was designed by the researchers below:

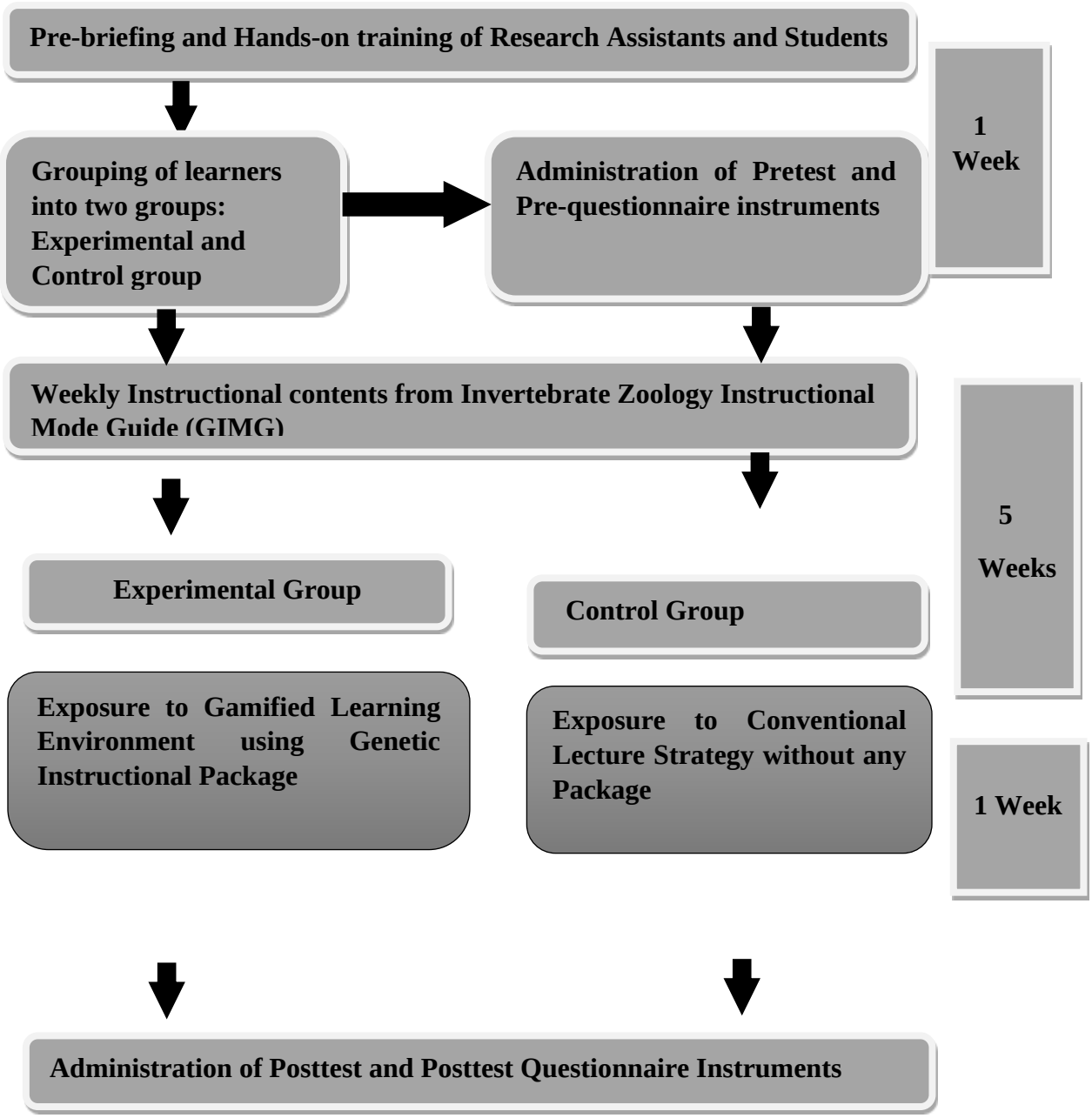

Figure 3. Phases for Data Collection Designed by the Researchers.

The data collected were analysed using Mean and Standard Deviation and inferential statistics of t-test, and two-ways analysis of covariance (ANCOVA) with the pre-test scores as covariates to test the hypotheses at 0.05 level of significance. Analysis of covariance was used to single out the initial group differences. Also, the Estimated Marginal Means (EMM) of the ANCOVA result was used to detect the magnitude and direction of differences.

RESULTS

Descriptive Statistics of Respondents

Table 1: Demographic Information of Students

Gender	Frequency	Percentage
Male	70	46%
Female	80	54%
Total	150	100%

Table 1 shows the frequency distribution of students who participated in the study based on gender. A total of 150 students participated. By gender; out of 1509 respondents, 70(46%) were male and 82(55%) were female.

Answering Research Questions

Research Question 1: **What is the effect of implementing the intervention on pre-service teachers' achievement in Biology?**
This question was answered using mean and standard deviation, which were computed using the scores of pre-service teachers in the experimental group before and after the treatment. The results of the analysis are as presented in table 2.

Table 2: Mean on the performance before and after using Gamified Flipped learning

Mode of test	N	Mean	SD	Gained Mean
Post-test	87	73.33	9.05	
				30.78
Pre-test	87	42.55	8.64	

Results in table 1 show that the mean scores of pre-service teachers before and after exposing them to gamified flipped learning are 42.55 and 73.33 respectively. And it can be seen that the mean score of pre-service teachers after exposing them to flipped learning strategy increased, as the gained mean =30. 78. Thus, gamified flipped learning has positive effect on the pre-service teachers' achievement in Biology.

Research Question 2**: Is there any difference in achievement between male and female pre-service teachers after intervention?**

Table 3: **Achievement of male and female pre-service teachers after using Gamified Flipped Learning Approach.**

Gender	N	Mean	SD
Male	43	75.56	8.69
Female	45	73.75	8.59

Results in table 3 show that the achievement mean scores of male and female pre-service teachers after exposing them to gamified flipped learning are 75.56 and 73.75 respectively. And it can be seen that male pre-service teachers had higher achievement score than the females. There's a slight difference in their achievement.

Testing of Null Hypotheses

Hypothesis 1a: **There is no significant main effect of treatment on pre-service teachers' achievement in Biology.**

Table 4: **Analysis of Covariance (ANCOVA) of Biology Achievement Test scores by Treatment and Gender.**

Source	Sum of Squares	Df	Mean Squares	F	Sig Eta Squared	Partial
Corrected Model	31341.143[a]	12	2611.762	47.70	0.000	.807
Intercept	24786.454	1	24786.45	452.7	0.000	.768
Pretest	43.071	1	43.071	.787	0.377	.006
Treatment	7986.168	1	7986.168	145.8	*0.00	.516
Gender	21.263	1	21.263	.388	0.534	.003
Treatment * Gender	70.637	1	70.637	1.290	0.258	.009
Error	7500.697	137	54.750			
Total	617676.000	150				
Corrected Total	38841.840	149				

R Squared = .807 (Adjusted R Squared = .790*) Denote significant difference at 0.05 level of sig

Table 4 revealed that there is significant main effect of treatment on pre-service teachers' Biology ($F_{(1,137)}$ = 145.87; P< 0.05, partial η^2 = 0.52). The effect size is 52.0%. This indicates that 59.0% of the variation in pre-service teachers' achievement is as a result of the significant main effect of the treatment. Thus, hypothesis 1a was rejected. In order to determine the magnitude of the significant main effect across

treatment groups, the estimated marginal means of the treatment groups was calculated and the result was presented in (Table 4.1).

Table 4.1: Estimated Marginal Means for Post-test by Treatment (Control and Experimental group)

Treatment	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Control (Conventional Strategy)	47.377	1.163	45.078	49.676
Experimental (Gamified Flipped Learning strategy)	68.311	1.177	65.984	70.639

Table 4.1 revealed that pre-service teachers in Experimental group (Gamified Flipped Learning) had the highest adjusted post-Biology Achievement Test mean score (68.31) while those in the Control group (Convention Strategy) had the least adjusted post- Biology Achievement Test mean scores (47.38).

Hypothesis 2: There is no significant main effect of gender (male and female) on pre-service teachers' achievement in Biology

Table 4 shows that there is no significant main effect of gender on pre-service teachers' Biology Achievement Test Scores ($F_{(1; 137)} = 0.39$, $p>.05$, partial $\eta^2 = 0.003$). Thus, hypothesis 2 was not rejected.

Hypothesis 3: There is no significant interaction effect of treatment and gender on pre-service teachers' achievement in Biology

Table 4 shows that there is no significant two-way interaction effect of treatment and gender on pre-service teachers' Biology Achievement Test Scores ($F_{(1; 137)} = 1.29$, $p>.05$, partial $\eta^2 = 0.009$). Thus, hypothesis 3 was not rejected.

Discussion of Findings

Effect of Treatment on pre-service teachers' achievement in Biology.

The study found that pre-service teachers exposed to gamified flipped learning approach had higher achievement scores in Biology compared to the control group. This suggests that gamified flipped learning is more effective than conventional teaching strategies in improving pre-service teachers' performance. The high achievement in the experimental group may be due to incentives that were given to students individually and in groups, inform of rewards such as points, stars, and levels, as well as study materials like video lessons and printed text. The study also found that a fun, engaging, friendly, and competitive learning environment increased students' enthusiasm, leading to higher performance in classwork and achieving their proximal development level at the end of the treatment process.

The study by Gunduz and Akkoyunlu (2020), Zainuddin et al. (2019), and Leftheriotis et al., (2017) supports the idea that incorporating gamification concepts into flipped classrooms can enhance students' academic achievement in Biology. Their study found that students in the gamified flipped classroom showed high motivation due to the satisfaction of their needs for competence, autonomy, and relatedness. This was attributed to the addition of challenges, incentives, points, and rewards to quiz questions, creating an engaging and meaningful learning experience. The study also demonstrated that this method can

stimulate engagement and genuine interest in the learning process. Thus, the use of gamified flipped learning strategies can significantly improve the academic achievements of pre-service teachers in Biology.

Effect of Gender on pre-service teachers' achievement in Biology

The study however, found that gender does not significantly impact the achievement and attitude of pre-service teachers in science subjects. This aligns with previous research of (Dania, 2014; Godpower-Echie & Ihenko, 2017; Oluwatayo, 2021), which found that students of different genders performed well in science subjects. However, male students often view biology as a feminine subject, leading to negative attitudes and poor performance. Nevertheless, they emphasized that female students do not have the tendency to outperforming the male students in the class, and male students do not have the tendency of outperforming their female counterpart. The study suggests that using interactive instructional strategies like gamified flipped learning can help bridge the performance and attitude gap between genders.

Conclusion

Since biology plays a crucial role in scientific and technological advancement of a nation, it is imperative to incorporate an active and engaging instructional strategies that will not only improve academic achievement but as well foster creativity, critical thinking, and collaboration and enhance effective communication skills among students. This study demonstrated that using gamified flipped instructional strategy effectively enhances the academic achievement of pre-service teachers in biology. By incorporating active and hands-on teaching methods, educators can promote positive attitudes, engagement, motivation, collaboration, critical thinking and overall learning outcomes.

Additionally, the study revealed that gender does not impact the achievement of pre-service teachers in biology when utilising an active instructional approach. Both male and female students performed equally well in a gamified flipped learning environment, as they become immersed in the game-like activities, face challenges and experienced improved behaviour and learning outcomes.

Recommendation

Based on the findings, this study recommends the following:

1. Government and professional bodies such as STAN, NTI and NUT etc., should expose biology teachers to new and active pedagogies which would help to foster creativity, collaboration and effective communication skills among students.
2. Educators should teach biology using gamified flipped instructional strategy because it has proven to be effective in improving the attitude and academic achievement of students not only in biology but also in other science related subjects.
3. Curriculum planners should use information provided in this research as a guide in subsequent planning of biology curriculum.

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SCIENCE TEACHERS' PERCEPTION OF THE USE OF SOCIAL MEDIA IN TEACHING AND LEARNING IN SENIOR SECONDARY SCHOOLS IN OSUN STATE, NIGERIA

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Abstract
This study investigates science teachers' perspectives on the incorporation of social media into teaching and learning practices in senior secondary schools in Osun State, Nigeria. Social media platforms have evolved into indispensable tools for information dissemination and collaborative learning, significantly influencing contemporary educational approaches. Guided by Vygotsky's theory of social learning and the theory of Uses and Gratification, a descriptive survey methodology was employed. Data was collected through the "Science Teachers' Perception of the Use of Social Media for Teaching and Learning Questionnaire" (STPUSMTLQ) from 200 science teachers across 20 senior secondary schools selected from four Local Government Areas. The questionnaire exhibited strong reliability, with a coefficient of 0.78. Data analysis entailed descriptive statistics, including mean, standard deviation, frequency count, and percentages. Results revealed that a majority of science teachers hold positive perceptions regarding the efficacy of social media in teaching and learning, with an average mean score of 2.51. Furthermore, many teachers acknowledged the beneficial impact of social media on their teaching experiences, averaging a mean score of 2.60. Various factors were identified as influencing the adoption of social media for teaching and learning, with an average mean score of 3.60. Among social media platforms, WhatsApp emerged as the most frequently utilised by science teachers, with a mean score of 2.64, followed by Facebook (mean = 2.45) and Twitter (mean = 2.32). Conversely, platforms such as LinkedIn and WeChat were rarely, if ever, utilised by teachers. In conclusion, the study underscores that the majority of science teachers in secondary schools exhibit positive perceptions of social media's efficacy in teaching and learning, with WhatsApp and Facebook being the most frequently employed platforms. Consequently, recommendations include organizing seminars by the school management to sensitise both teachers and students on the effective integration of social media for educational purposes.

Keywords: Social media, Integration, Teacher perceptions, Senior secondary schools

Introduction

The integration of social media platforms into educational settings has emerged as a transformative trend in recent years, offering new avenues for communication, collaboration, and knowledge sharing. As technology continues to reshape the landscape of teaching and learning, educators are increasingly exploring innovative ways to leverage digital tools to enhance the educational experience. The advent of social media has transformed communication patterns, enabling instantaneous interaction and information sharing across diverse geographical locations (Shrestha, Zia & Shrestha, 2013; Asian, 2010). Additionally, the integration of technology in education has been a topic of interest for educators, policymakers, and researchers alike. With the rapid advancement of digital tools and platforms, social media has emerged as a promising avenue for enhancing teaching and learning in various educational settings. Social media refers to a range of online applications and tools that facilitate social interaction and communication among digital media users (Hansen et al., 2017). It has transformed traditional one-way communication into dynamic dialogues, enabling knowledge sharing and collaboration among users.

A shift in social norms, values, and cultural dynamics has accompanied the rise of social media. It has become a cornerstone of contemporary society, shaping social interactions, information consumption

patterns, and personal branding (Al-sharqi & Hashim, 2017; Berezan, 2018; Stathopoulos, 2019). In education, social media has revolutionised how students engage, interact, and socialise during their academic journeys (Terzi et al., 2019). It has provided opportunities for student-centered learning, critical thinking, problem-solving, and authentic learning experiences (Duncan, 2013). Science teachers increasingly use social media to enhance teaching and learning, engage students, and promote scientific literacy. They leverage various platforms, such as YouTube, where they create channels to share video lessons, experiments, and demonstrations, making complex concepts more accessible (Hew, 2014). On Facebook Groups, they facilitate online communities for students to discuss course material, ask questions, and share resources, promoting peer-to-peer learning and collaboration (Greenhow & Robelia, 2009). Additionally, teachers use blogs to share their experiences, reflections, and resources with a wider audience, providing a platform for students to publish their scientific writing and projects (Watters, 2011). Furthermore, social media empowers teachers to share resources, collaborate with peers, and connect with students and parents (Rutherford, 2010). This engagement in digital media sharing and social networking not only offers educational advantages but also fosters personal interactions and communication. It allows users to establish their personal brands and access professional opportunities (Berezan, 2018).

Despite its potential, the use of social media in education is still a relatively new and understudied area, particularly in senior secondary schools. Senior secondary schools are a critical stage in students' educational journey, as they prepare for higher education and the workforce. Therefore, it is essential to understand how science teachers in senior secondary schools perceive the use of social media in teaching and learning. Science teachers hold a pivotal position in molding students' learning journeys and achievements, with their perceptions significantly impacting the incorporation of social media into their instructional methods (Ertmer, 2005). Specifically, for science educators, social media stands as a potent instrument for advancing scientific literacy, nurturing critical thinking skills, and fostering active student involvement with intricate scientific ideas (Banchi & Bell, 2008). Studies have shown that science teachers who incorporate social media into their teaching practices can benefit from increased student motivation, improved communication, and enhanced collaboration (Withey, 2014). Furthermore, social media can provide science teachers with a platform to share their own experiences, insights, and expertise with a wider audience, potentially influencing public perceptions of science and promoting a greater understanding of scientific issues (Eisenhart & Edwards, 2016). Research has shown that teachers' perceptions of technology can influence their use of technology in the classroom (Inan & Lowther, 2010). Teachers who have positive perceptions of technology are more likely to use it in their teaching practices, while those who have negative perceptions are less likely to adopt it (Teo, 2009). Furthermore, teachers' perceptions of technology can also influence their students' attitudes towards technology (Li, 2010).

While some studies have explored the use of social media in education, few have focused specifically on science teachers' perceptions of social media in senior secondary schools. This study aims to address this gap by investigating science teachers' perceptions of the use of social media in teaching and learning in senior secondary schools. The study will explore the benefits and challenges of using social media in science education, as well as the factors that influence science teachers' adoption and integration of social media in their teaching practices. The findings of this study can inform the development of policies and practices that support the effective integration of social media in science education in senior secondary schools.

Research Purpose

This study aims to explore the perceptions of science teachers in senior secondary schools in Osun State, Nigeria, regarding the use of social media in teaching and learning practices. Specifically, it seeks to answer the following research questions:

Research Questions

1. What is the perception of science teachers on the use of social media in education?

2. Does the use of social media enhance the teaching experience of science teachers?
3. What is the frequency of use of social media by science teachers in secondary schools?
4. What Factors limit the use of social media by science teachers for teaching and learning?

Research Methods

This study employed a descriptive survey research design to investigate the perceptions of science teachers in government senior secondary schools in Osun Central Senatorial District, Osun State, Nigeria, regarding the use of social media for teaching and learning. The population of this study consisted of all science teachers in government senior secondary schools in Osun Central Senatorial District, Osun State. A sample of 200 experienced science teachers was selected from the population using a simple random sampling technique. The sampling procedure involved selecting four Local Government Areas (LGAs) from Osun Central Senatorial District, followed by the selection of 20 secondary schools from the four LGAs. Five schools were selected from each LGA, and 10 science teachers from each of the selected schools participated in the study. A well-constructed questionnaire, titled Science Teachers' Perception of The Use of social media for Teaching and Learning (STPUSMTLQ), was used to collect data from the respondents. The questionnaire consisted of two sections: Section A and Section B. Section A collected demographic data from the teachers, including their name, school, qualification, years of experience, gender, types of devices used, and subject of specialization. Section B contained items that assessed how teachers perceived the use of social media for teaching and learning. The items were rated on a 4-point Likert scale, with options ranging from Strongly Agree (SA) to Disagree (D). The reliability of the instrument was tested by administering it to 20 science secondary school teachers outside the sample area. The Cronbach's Alpha reliability coefficient was calculated to be 0.78, indicating a high level of internal consistency. The data collected from the respondents were analyzed qualitatively using descriptive statistical analysis. The analysis involved calculating the mean, standard deviation, frequency count, and percentage mean for each item on the questionnaire. The results were presented in tables and figures to facilitate easy interpretation.

Results

Demographic Analysis

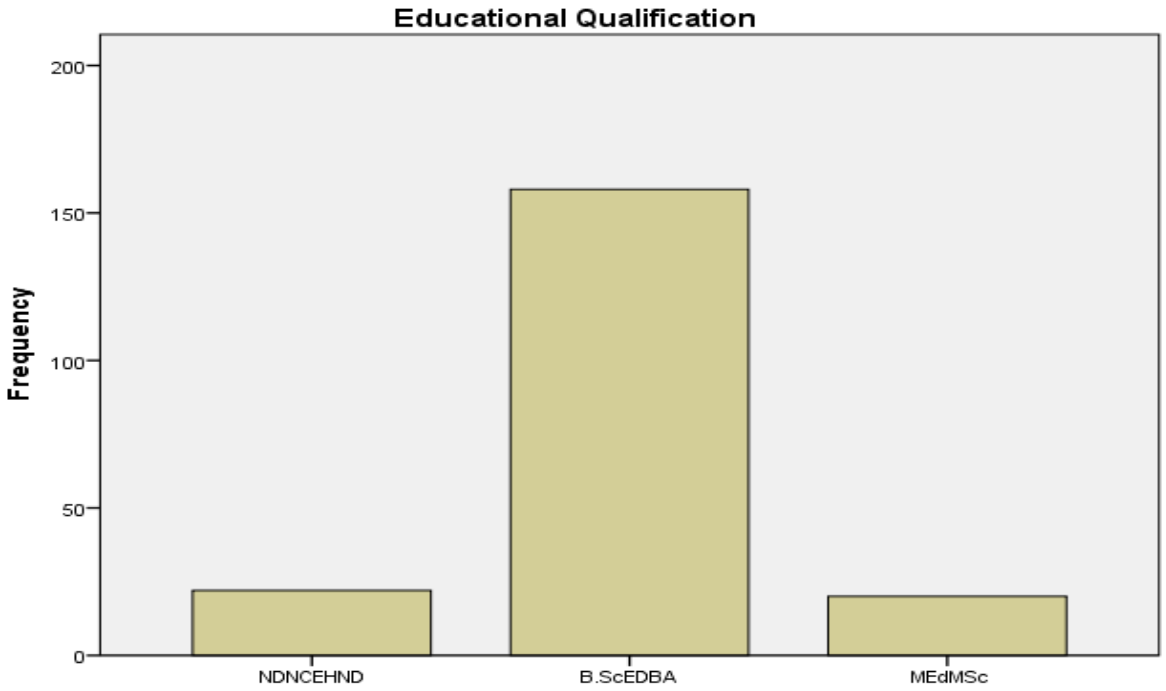

Figure 1: Frequency Distribution of Respondents by Educational Qualification

The frequency distribution of the respondents based on their educational qualifications is presented in Figure 1. The results show that 25 respondents (12.5%) held a National Diploma (ND), Nigeria Certificate in Education (NCE), or Higher National Diploma (HND). The majority of the respondents, 150 (75.0%), held a Bachelor of Science in Education (B.Sc. Ed), Bachelor of Education (B.Ed.), or Bachelor of Arts (B.A) degree. Additionally, 25 respondents (12.5%) held a Master of Education (M.Ed.), Master of Science (M.Sc.), or Master of Arts (M.A) degree.

Figure 2: Frequency Distribution of Respondents by Years of Working Experience

The frequency distribution of the respondents based on their years of working experience is presented in Figure 3. The results show that 36 respondents (18.0%) had 5 years of working experience, while 54 respondents (27.0%) had 10 years of experience. Additionally, 48 respondents (24.0%) had 15 years of experience, 24 respondents (12.0%) had 20 years of experience, and 2 respondents (1.0%) had 25 years of experience. Furthermore, 36 respondents (18.0%) had more than 25 years of working experience.

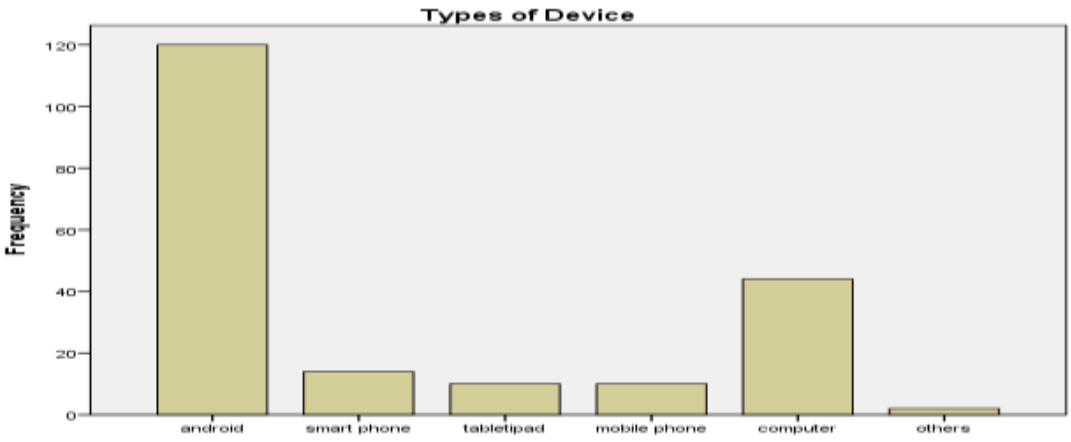

Figure 3: Frequency Distribution of Respondents by Types of Devices Used

The frequency distribution of the respondents based on the types of devices they used is presented in Figure 4. The results show that the majority of the respondents, 120 (60.0%), used Android devices. Additionally, 14 respondents (7.0%) used smartphones, 10 respondents (5.0%) used tablets or iPads, and 10 respondents (5.0%) used mobile phones. Furthermore, 44 respondents (22.0%) used laptops or computers, while 2 respondents (1.0%) used other types of devices.

Research Questions

Research question 1: What is the perception of science teachers on the use of social media in education?

Table 1 shows the perception of science teachers on the use of social media in education

S/N	Items	SA	A	D	SD	Mean	STD
1	I feel that using social media would enable me to accomplish teaching and learning activities more quickly.	86 43.0%	100 50.0%	8 4.0%	6 3.0%	1.67	0.69
2	I do not find social media useful in my teaching	12 6.0%	18 9.0%	76 38.0%	94 47.0%	3.26	0.85
3	I perceived that using social media would enhance my effectiveness when performing my classroom tasks.	46 23.0%	124 62.0%	22 11.0%	8 4.0%	1.96	0.70
4	I do not feel that using social media can give me greater control over my work	16 8.0%	22 11.0%	104 52.0%	58 29.0%	3.02	0.85
5	I perceived that using social media to teach would create an interesting and active learning atmosphere.	58 29.0%	104 54.0%	24 12.0%	14 7.0%	1.97	0.83
6	I do not feel that using social media would enhance my effectiveness when performing my classroom tasks.	16 8.0%	14 7.0%	132 66.0%	38 19.0%	3.96	0.76
7	I do not feel comfortable using social media for teaching	12 6.0%	6 3.0%	80 40.0%	102 51.0%	3.36	0.80
8	I am not satisfied with the teacher-learner interaction when using social media for teaching and learning	18 9.0%	64 32.0%	58 29.0%	60 30.0%	2.80	0.97
9	I am aware that the use of social media in school makes teaching and learning effective.	86 43.0%	84 42.0%	18 9.0%	12 6.0%	1.78	0.84
10	I feel that using social media in teaching would make explanations easy.	94 47.0%	84 42.0%	12 6.0%	10 5.0%	1.69	0.79
11	I do not feel that using social media would enhance better interaction with my students	18 9.%	22 11.0%	100 50.0%	60 30.0%	3.01	0.87
12	I feel that it is very important for everyone to be proficient in the use of social media for teaching	68 34.0%	116 58.%	16 8.0%	- -	1.74	0.59

Average mean = 2.51

The detailed analysis of Table 1 revealed that the secondary school teachers agreed to the following statements: I feel that using social media would enable me to accomplish teaching and learning activities more quickly (Mean = 1.67), I perceived that using social media would enhance my effectiveness when performing my classroom tasks (Mean=1.96), I perceived that using social media to teach would create an interesting and active learning atmosphere (Mean=1.97), I am aware that the use of social media in school makes teaching and learning effective (Mean=1.78), I feel that using social media in teaching would make explanations easy (Mean=1.69). Therefore, science teachers in Osun State have positive perceived influence of social media on education with the Average mean of 2.51, out of the maximum obtainable score of 4.00, which is higher the standard mean of 0.79. This implies that science teachers have a good perception toward the usage of social media in education. The indication of the result was that secondary school teachers particularly teachers in Osun State supported the use of social media as a tool for the teaching-learning process for a better education system.

Research question 2: Does the use of social media enhance the teaching experience of science teachers?
Table 2 shows how the use of social media enhances the teaching experience of science teachers

S/N	Items	SA	A	D	SD	Mean	STD
1	I do not enjoy using social media to teach my students	24 12.0%	18 9.0%	132 54.0%	50 25.0%	2.92	0.90
2	I do not feel that social media can promote an interactive and engaged teaching-learning process.	26 13.0%	22 11.0%	66 10.0%	20 10.0%	2.73	0.81
3	I feel that Social media makes me comfortable because I understand how to use it in teaching.	68 34.0%	104 52.0%	20 10.0%	8 4.0%	1.84	0.75
4	I need training on how to use social media in teaching	26 13.0%	48 24.0%	82 41.0%	44 22.0%	2.72	0.95
5	I do not find social media convenient to use for teaching my students	18 8.0%	20 10.0%	100 50.0%	64 32.0%	3.06	0.86
6	I do not feel that I can use social media for teaching effectively day by day	16 8.0%	20 10.0%	102 51.0%	62 31.0%	3.05	0.85
7	I would rather prefer to adopt the traditional mode of teaching, instead of using social media.	20 10.0%	26 13.0%	92 46.0%	62 31.0%	2.98	0.91
8	I would prefer to use social media in any of my classes.	58	92	34	16	2.04	0.88

		29.0%	46.0%	17.0%	8.0%		
9	I do not enjoy using social media to teach my students	16 8.0%	26 13.0%	92 46.0%	66 33.0%	3.04	0.88
10	I feel it would be easy to control the class through the use of social media	26 13.0%	92 46.0%	64 32.0%	18 9.0%	2.37	0.82
11	I need training on how to use social media in teaching	26 13.%	50 25.0%	80 40.0%	44 44.0%	2.71	0.95
12	I do not feel that it is very important as a teacher to be proficient in the use of social media for teaching	22 11.0%	40 20.%	90 45.0%	48 24.0%	2.82	0.92
13	I do not feel that the use of social media would help me to provide immediate feedback to my students.	22 11.0%	80 40.0%	84 42.0%	14 7.0%	2.45	0.78
14	I perceived that using social media would make me versatile in my profession	86 43.0%	86 43.0%	18 9.0%	10 5.0%	1.76	0.81
Average mean = 2.60							

The detailed analysis of Table 2 revealed that the secondary school teachers agreed to the following statements: I perceived that using social media would make me versatile in my profession (Mean=1.76), I feel it would be easy to control the class through the use of social media (Mean=2.37), I would prefer to use social media in any of my classes (Mean=2.04), I feel that Social media makes me comfortable because I understand how to use it in teaching (Mean=1.84). therefore, Science teachers in Osun State have a positive perceived influence on how social media will enhance their teaching experience with an average mean of 2.60, out of the maximum obtainable score of 4.00, which has a higher standard mean of 0.95. This implies that science teachers have a good perception of how social media will enhance the teaching experience. The indication of the result was that secondary school teachers particularly teachers in Osun State supported the use of social media as a tool for the teaching-learning process for better education system.

Research question 3: What Factors limit the use of social media by science teachers for teaching and learning?

Table 3: shows the factors that limit the use of social media by science teachers for teaching and learning

S/N	Items	SA	A	D	SD	Mean	STD
1	There is no internet network in my area to connect with my students	32 34.0%	34 17.0%	110 55.0%	24 12.0%	2.63	0.89

2	Students develop a lazy attitude towards lessons if they use social media	28 14.0%	94 47.0%	64 32.0%	14 7.0%	2.32	0.80
3	I feel that Students are easily distracted while using social media for teaching and learning.	26 13.0%	92 12.0%	70 45.0%	12 6.0%	2.45	0.79
4	The use of social media for teaching and learning may encourage malpractice	34 17.0%	76 38.0%	70 35.0%	20 10.0%	2.38	0.88
5	Teachers have no devices to support social media learning.	26 13.0%	40 20.0%	116 58.0%	18 9.0%	2.63	0.82
6	The cost of the devices is too high and it is a problem affecting the use of social media in teaching and learning	38 19.0%	114 57.0%	30 15.0%	18 9.0%	2.14	0.82
7	The use of social media for teaching and learning causes unproductive behaviour.	14 7.0%	74 35.0%	72 36.0%	40 22.0%	2.73	0.88
8	I feel that the use of social media for teaching and learning can expose the students to inappropriate materials	18 9.0%	82 41.0%	80 40.0%	20 10.0%	2.51	0.79
9	I feel that there is difficulty in class control while using social media for teaching	26 13.0%	52 26.0%	106 53.0%	14 7.0%	2.54	0.80
10	I feel the student misuse the social media tools during instructional time	32 16.0%	124 62.0%	30 15.0%	14 7.0%	2.13	0.75
11	Using social media for teaching and learning bring about waste of time	22 11.0%	30 15.0%	104 52.0%	44 22.0%	2.85	0.88
12	I feel that the use of social media brings about unsolicited negative comments during the teaching-learning process	18 9.0%	28 14.%	136 68.0%	18 9.0%	2.77	0.73
Average mean = 3.60							

The detailed analysis in Table 3 revealed that secondary school teachers in Osun State have had so many factors that limit the usage of social media by science teachers for teaching and learning and its average mean of 3.60, out of the maximum obtainable score of 4.00, which has higher the standard mean of 0.89. This implies that science teachers have many factors limiting the use of social media for teaching and learning. The result indicated that secondary school teachers particularly teachers in Osun State have been

influenced by factors that limit the usage of social media as a tool for the teaching-learning process for a better education system.

Research question 4: What is the frequency of use of social media by science teachers in secondary schools?

Table 4: Shows the frequency of use of social media by science teachers in secondary schools

S/N	Items	VO	O	R	N	Mean	STD
1	Whatsapp	114	86	-	-	2.64	0.89
		57.0%	43.0%	-	-		
2	Twitter	40	96	32	32	2.32	0.80
		20.0%	48.0%	16.0%	16.0%		
3	Facebook	102	66	30	2	2.45	0.79
		51.0%	33.0%	15.0%	1.0%		
4	Telegram	14	58	70	58	2.38	0.88
		7.0%	29.0%	35.0%	29.0%		
5	LinkedIn	26	16	76	82	2.14	0.82
		13.0%	8.0%	38.0%	41.0%		

Table 4 shows that WhatsApp is the highest among all other social media with (Mean=2.64), followed by Facebook which is one of the social media that is frequently used among science teachers (Mean=2.45), Twitter with (Mean=2.32). Other social media that are rarely used or not used by science teachers are Telegram (Mean=2.38) and LinkedIn (Mean=2.14). The highest standard mean is 0.89. This can be interpreted as a spread of this application among users in secondary schools in Osun state, and its ease of use in society, since it is a tool for communication and is available in e-stores for free download.

Discussion of Findings

Many science teachers have positive perceptions towards the use of social media in education. This is consistent with a study conducted at South East European University by Bexheti et al. (2016), which found that social media is already influencing how teachers discover, create, share, and learn knowledge through media opportunities and collaboration with each other. The study revealed that teachers view social media as a valuable tool for teaching and learning, with almost all teachers in the study being aware of major social media sites and over 75% having visited a social media site within the past month. Nearly 25% of teachers also posted content on social media. However, there is a significant variation in usage patterns across different social media platforms. Furthermore, the majority of teachers agreed that using social media would enable them to complete teaching and learning activities more efficiently, which aligns with the findings of Stathopoulou et al. (2019) that incorporating social media in education has a positive impact on students' deep learning experience. Social media serves as a supportive tool for students during the learning process and is beneficial for educators as well.

The majority of science teachers hold a positive view towards using social media as a means of providing timely feedback to their students. This is consistent with the findings of Li (2017), who conducted a study on the use of social media for teaching English via Facebook in a polytechnic institution in China. The teacher in this study suggested that students create a company Facebook page for collaborative group work, which significantly improved student engagement in the project. This is in line with the findings of Tess

(2013), who found that social media can promote a more interactive and engaging learning environment in science education. Similarly, Manca and Ranieri (2016) discovered that social media can facilitate collaborative learning and knowledge co-construction in science education. However, it is important to note that the effective use of social media in teaching requires careful planning and consideration of potential challenges, such as privacy concerns and digital distractions (Carpenter and Krutka, 2014).

Despite the potential benefits of social media in education, several factors limit its use by science teachers for teaching and learning. The research revealed that most science teachers in secondary schools in Osun state have experienced limitations in using social media, including the lack of internet connectivity in classrooms, which hinders students' ability to access online resources (mean = 2.63, below the average mean of 3.60). Additionally, students are easily distracted while using social media, which can negatively impact their learning experience. Furthermore, the use of social media for teaching and learning remains low due to various reasons. One major constraint is the high cost of devices, which makes it difficult for teachers and students to access social media platforms (Alabdulkareem, 2015). Moreover, social media requires adequate relevant resources to support learners' activities, which may not always be available (Jewitt et al., 2010). Learners may not have equal access to resources, and some may not have the necessary skills to interact with others through online discussions (Arkorful & Abaidoo, 2017). Another significant challenge is the difficulty in class control while using social media, which can lead to unsolicited negative comments during the teaching-learning process. Teachers must be comfortable with the use of online learning tools to effectively integrate social media into their teaching practices (Bora & Ahmed, 2013). Social pressure can also influence the adoption of social media in education (Bora & Ahmed, 2013). As Gefen and Straub (2010) noted, the inherent qualities of social media for information exchange do not guarantee its adoption for every activity and by everyone, including in the learning process.

The frequency of social media use among science teachers in secondary schools, particularly in Osun state, reflects a notable reliance on WhatsApp as the primary platform, closely followed by Facebook (Fasae & Adegbilero-Iwari, 2016; Sim, Naidu & Apparasamy, 2014; Lie, 2013). This trend is consistent with previous studies that have shown Facebook to be a popular social media platform among teachers (Lie, 2013). Lie (2013) found that 31.6% of teachers spent 2-4 hours per day using social media, including Facebook, Twitter, Tumblr, and Edmodo. Similarly, Yeo (2014) found that both students and lecturers viewed Facebook as a valuable "social" platform, fostering relationships beyond the confines of the classroom through seamless connectivity and information exchange. This suggests that social media platforms like Facebook can play a significant role in promoting collaborative learning and building relationships between teachers and students. Moreover, Albalawi (2017) discovered that WhatsApp emerged as the dominant social media tool among mathematics teachers, used by a significant majority of participants. However, its integration into mathematics instruction was classified as "sometimes," indicating a potential underutilization of social media's pedagogical potential in certain domains (Albalawi, 2017). This highlights the need for teachers to explore innovative ways to integrate social media into their teaching practices, particularly in subjects like mathematics where visual and interactive learning can be beneficial. The reliance on WhatsApp and Facebook among science teachers in secondary schools in Osun state suggests that these platforms are seen as convenient and accessible tools for communication and collaboration. However, it is essential to recognize the potential limitations of social media in teaching and learning, and to explore ways to harness their pedagogical potential more effectively.

Conclusion

This study has highlighted the positive perception of science teachers towards the use of social media for teaching and learning. The frequent use of WhatsApp among science teachers in secondary schools in Osun state is noteworthy, but there is a need for teachers to explore other social networking sites to enhance their teaching practices. However, the study also identified several factors that limit the use of social media in teaching and learning in secondary schools in Nigeria. These limitations may negatively impact the attitudes of teachers towards the use of social media for learning. Therefore, it is crucial to address these challenges to promote the integration of social media into teaching and learning in secondary schools. The use of

social media in teaching and learning offers numerous advantages over traditional means. It provides opportunities for collaborative learning, seamless connectivity, and information exchange beyond the confines of the classroom. Therefore, the government should encourage the use of social media for teaching and learning in secondary schools and create an enabling environment for its effective integration into the curriculum.

This study underscores the importance of social media in enhancing teaching and learning in secondary schools. It is essential to address the challenges limiting its use and encourage the exploration of other social networking sites to maximize its pedagogical potential.

Recommendations

Based on the findings of this study, the following recommendations are suggested:

1. Teachers should embrace social media as a valuable tool for disseminating relevant information to their students. By doing so, teachers can create engaging, interactive, and collaborative learning environments that can enhance students' academic performance and prepare them for the digital age.
2. Teachers should guide students on the proper use of social media to prevent its negative use. By providing clear guidelines and expectations, teachers can help students develop healthy online habits and avoid potential risks associated with social media use.
3. Teachers should receive training on how to effectively use social media for teaching and learning. This training can help teachers develop the necessary skills and knowledge to leverage the benefits of social media and create engaging, interactive, and collaborative learning environments.
4. School management should organize seminars to sensitize both teachers and students on the effective use of social media. These seminars can provide an opportunity for teachers and students to learn about the benefits and risks associated with social media use and develop strategies to use it effectively in the classroom.
5. Stakeholders should formulate policies to strengthen and guide the use of social media in schools. These policies should address issues such as privacy, security, and responsible use of social media. By doing so, stakeholders can create a safe and supportive learning environment that promotes the positive use of social media in education.

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NIGERIAN UNIVERSITIES LECTURERS' AWARENESS OF, ACCESS TO AND COMPETENCY IN THE USE OF GOOGLE APPS FOR EDUCATION (GAFE)

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Abstract

The emergence of Information and Communication Technology (ICT) and its integration into teaching and learning have led to qualitative delivery of lecture and learning by lecturers and students respectively. However, studies reveal that most lecturers in Nigerian Universities have low level of awareness, access to and competency in handling ICT tools. This research therefore, investigated lecturers' awareness of, access to and competency in the use of Google Apps for Education (GAfE) in Nigerian universities. The objectives investigated into: (i) university lecturers' awareness of GAfE; (ii) university lecturers' access to GAfE; and (iii) competency of University lecturers' use of GAfE. The research was a descriptive method of the survey type. The population comprised all lecturers in Nigeria universities registered with Google (2,800), out of which 1,042 lecturers were sampled. Descriptive statistics, percentage and means were used to analyse collected data for the research questions.
The findings were that:

i. university lecturers were aware of GAfE (74.1%);
ii. a total of 531 (55.4%) lecturers had access to GAfE in their personal offices while 44.6% had access to it at home and other places in the academic area like library, computer laboratory and classroom; and
iii. lecturers were generally not competent in the use of GAfE as the observed grand mean of 1.96 was lower than the benchmark score of 2.5;

The study concluded that lecturers were aware and had access to GAfE but access limited to their offices. Given chance, there is readiness in lecturers to make use of GAfE for instruction. The implication was that, using GAfE for teaching would revolutionize classroom activities and would enhance the process of communication both within and outside the university. It was recommended that Nigerian university be licenced to use GAfE for teaching and learning.

Keywords: Access, Assessment, Awareness, Competency and Google Apps for Education.

Introduction

The application of evolving technology for instruction is an idea that has characterized the twenty-first century research, teaching and learning. Nigeria Computer Society (NCS) opined that emerging technologies is an integral part of Information and Communication Technology (ICT) that has the potential to accelerate, motivate and engage both lecturers and students for instruction (Nigeria Computer Society, NCS, 2014 & GoGuardian Team (2024). Some of these technologies are cloud computing, games and gamification, tablet computing, mobile learning, open content, learning analytics, three dimensional (3D) printing, wearable technology, Massively Open Online Courses (MOOCs), Online learning, remote

laboratories, Edmodo, periscope, learning management system (LMS), Google Apps for Education (GAfE) and so on.

The application of emerging technologies has greatly improved the quality of research, teaching and learning at every level. Google Apps for Education (GAfE) is an offshoot of emerging technology with the capacity to move research, teaching and learning from analogue to digital technology (Twaki, 2013). GAfE have implications for future infrastructural requirements and could as well have impact on instructional organization because it cannot be separated from wider issues impacting on education and training.

GAfE is a cloud-based productivity suite that possess feature that has the capacity to help connect users and get work done from anywhere, on any device. It is simple to setup, use and manage the application. It is a suite that enables users to work smarter and focus on what really matters. It is a productivity suite for institutions who signed a Memorandum of Understanding with Google (Google, 2016). It is easy to use for both students and teachers, because some of the tools are being used already like Google Mail, Calendar, Sites, Sheets and so on. GAfE tools work together in a similar menus and functions that are related to regular generic software like Words Document, Excel, PowerPoint and PageMaker. Files on GAfE are cloud based that back up files and documents on Google's servers which make them accessible from any computer and mobile device. Instruction on GAfE can become engaging, interactive, and collaborative. GAfE users are well informed through Google+, Google reader, and Google news. GAfE allows users to search more efficiently with scholar, safe search, advanced search and other custom searches. GAfE allows connection and communication with students, parents, and colleagues using Gmail and Google+, Google+ Circles, Google Groups, among others (Yusuf, 2016).

There are different types of Google apps, namely: Google apps for business, Google apps store, Google apps account, Google scholar, Google Apps for Education among others. Google Scholar was introduced in November, 2004 as a free citation analysis tool that can be used in conjunction with the traditional commercial subscription citation products such as Thomson Reuters Web of Science and Scopus (Web of Science, 2020). There are lot of advantages associated with using Google Scholar: it very fast and easy to use; it is a free search tool that offers content that are free, open, visible and retrievable; it indexes academic literature across an array of publishing types and formats; it is very broad, comprehensive and also an important free citation source that indexes resources that the traditional commercial citation databases do not cover (Web of Science, 2020).

In relation to Google Scholar, GAfE is one of the new discovery for teaching and learning (Google, 2019). It is a powerful solution to meet the needs of both lecturers and students. It is a web-based application that gives room for email, calendar, drives, sites and documents collaboration for study anytime, anywhere. Google Apps for Education contains some suits of productivity tools which include Google Drive, Classroom, Slides, Sites, Calendar, Gmail, Docs, Sheets among others is a tool that was designed hand-in-hand with teachers or for lecturers, to help them keep Online (Virtual) classes organised, manage time, and improve interaction with students (GoGuardian Team, 2024).

Google (2019) asserted that classroom is made available to anyone with GAfE to enable lecturers communicate with their students and easily share assignments, materials, and information. Plan is in progress with Google to make classroom available to everybody with Google account. This will enable individual to run GAfE and not necessarily to be attached to an institution. Google Apps for Education include dozens of critical security features specifically designed to keep institution's data secure, safe and in a perfect control. In a scenario where lecturer is teaching in classroom situations, efforts are made to view the students **holistically while s**tudents enter classroom from a variety of background and bring with them different expectations, experiences and assumptions. More than two million students and lecturers around the world are using Google Apps for Education because it can be used across different devices and operating systems (Google, 2016). GAfE support acquisition of 21st century skills lecturers and students need for the future. These include collaboration, communication, creativity and critical thinking.

Google Apps for Education could allow both lecturers and students to possess enough wealth of research, build and produce technology needed for the university. This is why universities are being equipped technologically for the twenty-first century challenges. Google, (2019) identified Nigerian

universities that have engaged GAfE for the purpose of teaching, learning and research. That is, each of these universities has duly signed a memorandum of understanding (MoU) with Google for adequate research, teaching, learning and collaboration among intellectuals.

GAfE is for schools, with daily support at no cost after the initial subscription. It never needs any ads-on, and the data is made strictly confidential and personal. It makes available for the user to create, share, and edit files in real-time. It enables lecturers and students to be on the same page, and the page is spontaneously put in storage in the cloud (Figure 1). Cloud technology or cloud computing enables individual and organizations to consume computed resources as a utility, just like electricity rather than having to build and sustain computing infrastructures in-house. It makes the academia interaction in the digital age to enjoy a consistent experience from any computer, tablet, or phone and grant ability to work anywhere and at any time (Cloud-Computing, 2021).

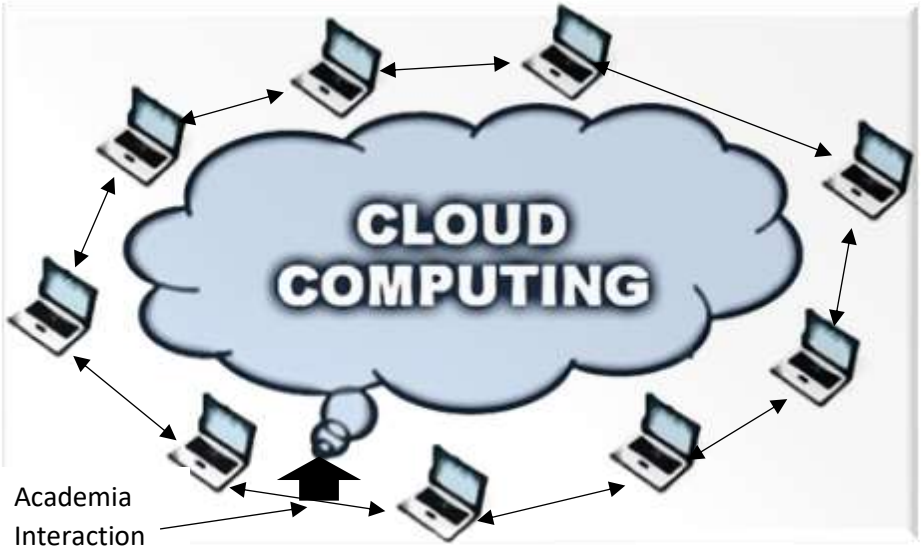

Figure 1: Current Scenario in the Digital Age

Source: Adapted from Jeff, (2011)

GAfE makes available additional storage across Gmail and drives that guarantee 99.9% uptime, it enhances security features and support full administration of all user accounts (Jeff, 2011). GAfE allows storage space of about 30 gigabites (GB) per account, allocated for use across all products including e-mail. GAfE supports content management system, that is, branded Google Classroom for document sorting and communication (Google, 2019). Microsoft Company is now making classroom available also to its subscribers but GAfE is a good choice to improved communication, collaboration and envisioned ways to enhance teaching and learning in Nigerian universities.

Table 1: Some of Google Apps by Type of Account and their Requirements

Google Apps	Requires Google Account	Gmail Address	Google Apps for Work Standard	Google Apps for Work Higher
Gmail	Yes	Yes	Yes	Yes
Google Apps Sync	Yes	Yes (Using Microsoft Exchange)	No	Yes
Google calendar	Yes	Yes	Yes	Yes
Google Contacts	Yes	Yes	Yes	Yes
Google Contacts Sync	Yes	Yes (Microsoft Exchange)	Yes	Yes
Google Drive	Yes	Yes	Yes	Yes
Google Groups	Yes	Yes	Yes	Yes
Google Sites	Yes	Yes	Yes	Yes
Google Tasks	No	Yes	Yes	Yes
Google Voice	No	Yes	Yes	Yes
Google Analytics	No	Yes	Yes	Yes
Google+	Yes	Yes	Yes	Yes
Classroom	Yes	Yes	Yes	Yes

Source: Google, (2014)

Some universities in Nigeria have Internet services available but not subscribed to GAfE while there are only few universities that subscribe to GAfE but do not utilize the benefits from the technology (Jeff, 2011). Nigeria comprises of thirty-six States and the Federal Capital Territory (FCT). The Federal Government of Nigeria through National Universities Commission (NUC) has enacted policies to enable tertiary institutions in the country to benefit from new technologies available in the digital society. Educational organizations are expected to implement the Federal Government reform agendas and lecturers are challenged to make full use of ICTs tools to develop student learning outcomes (Afolabi, 2011). Nigerian universities therefore need to build their programmes on the platform of knowledge and skills as prevalent in developed countries like Japan, United States of America, Canada, France and so on. Part of these strides include adequate legal framework for a knowledge based education, data security, infrastructure, Information Technology (IT) literacy, and Google Apps for Education application (NCS, 2014).

There are many technologies currently available for teaching and learning in tertiary institution globally therefore Nigerian universities should not be in exception to integrate these technologies. Moreover, it was discovered that some of these universities are not engaging in the use of these technologies for instruction as expected when likened to the industrialized countries like America, Japan, Italy, France and so on (Twaki 2013 & Niba 2014). It is possible that, some of these universities are not aware of these technologies which include cloud computing, wearable technologies, social media, GAfE and many more.

Thus, awareness to new technology is imperative since this will accelerate the incorporation for teaching and learning. Twaki (2013) asserted that, some of the universities that are aware of GAfE are not using it to the maximum because they lack infrastructure like internet, bandwidth and internet service provider (ISP) to fully employ the usage by the lecturers for teaching, learning and research.

UNESCO (2005) defined competency as a set of attributes that covers knowledge, skills and attitudes for enabling one to effectively perform activities of a given occupation or function to the standard expected in employment. The competency with regard to the use of GAfE for instruction is wider than the general skills needed to use ICT. The type of competency needed in this regard is ability to manipulate, control, and use Google Apps for Education packages or programmes for instruction in relation to academic matters. The rationale for accessibility and use of GAfE for teaching, learning and research process in Nigerian Universities is justified on the strength of the strategic position Universities occupy in the educational system and manpower development (UNESCO, 2023).

Current world economy system recognises the advancement in digital technological development and benefits derived from ICT in various industries, like banking system, business, transportation, aviation, communication and so on, hence education industry should not be left out. There is serious need therefore to digitised activities in the classroom in other to produce competent manpower for the new age.

The use of technologies in Nigerian Universities is still very poor and this makes education to lag behind as new technologies particularly for teaching and learning are not adequately embraced (Patrick, 2014). Yusuf and Onasanya (2004) and Cothran (2012) acknowledged ICT tools as crucial to teaching and learning, in view of this, ICT's use in education by academia and students has become a vital tool that is yet to be used to its fullness.

Afolabi (2011) observed that few lecturers are confident in using a wide range of ICT resources, and limited confidence affects the way lecturers conducted their lessons. This was why Afolabi (2011) concluded that lecturer's technological phobia, lack of adequate awareness and access to new technologies prevent them from making much use of new technologies in their teaching.

Kathy, (2015) reported that there are few cases where technologies are available for instruction but the lecturers' competency in handling them are still very low. This might have prompted lecturers adhering to their traditional method of chalkboard, paper and pencil assessment and method of communication. Hence, the study sought to ascertain the level of lecturers' awareness of, access to and competency in the use of Google Apps for Education in Nigerian universities.

The main purpose of the study was to assess lecturers' awareness of, access to and competency in the use of Google Apps for Education in Nigerian Universities. Specifically, the study:

1. investigated University lecturers' awareness of Google Apps for Education;
2. investigated University lecturers' access to Google Apps for Education; and
3. assessed the competency of University lecturers' use of Google Apps for Education;

The following research questions were generated to monitor the conduct of this study:

1. Are University lecturers aware of the use of Google Apps for Education?
2. Do University lecturers have access to Google Apps for Education? and
3. What is the level of University lecturers' competent in the use of Google Apps for Education?

This study primarily focused on University lecturers in Nigeria. The Universities comprised federal universities, state universities and private universities. Specifically, the study assessed lecturers' awareness of, access to and competency in the use of Google Apps for Education (GAfE) in the selected Nigerian universities. The study employed descriptive research design of the survey method for the investigation by administering questionnaire to seek the respondents' opinion. The researcher makes use of Israel (2013) model to determine the sample size. The sample size for the study consisted of 1,585 lecturers out of the total population of 2,800.

Methodology

The study employed descriptive research design of the survey method. This type of research design usually involves large samples to ensure meaningful representation and description which is relevant to the study. This method also enables the researcher to find out and interpret event and idea the way they are without manipulation.

The population for the study consisted of Nigerian University lecturers. Multi-stage sampling technique was adopted for the study. In the first stage, five Universities were purposively selected because these are the Universities in Nigeria that have subscribed to GAfE and are already utilising the technology as at the time of the study. The researcher made used of Israel (2013) model to determine the sample size at University A while census sampling was used at B, and C because of their low population.

The sample size for the study consisted of 1,585 out of 2,800. In the second stage, proportional sampling techniques was used to draw the precise number of representative sample from each of the University. The total number of lecturers that actually participated in the study were 959 because some completed copies of the instrument were not valid and some of the lecturers repudiated the instrument. This mean that, researcher received 61% of the instrument from the respondents.

Table 2:

Sample Size of the Study

University	Total Population	Sample based on Israel Model (±3%)
1. University A	1,915	700
2. University B	450	450
3. University C	435	435
TOTAL	2,800	1,585

Source: Field Study Result

The instrument for the research was a structured questionnaire titled Assessment of University Lecturers' Awareness, access and Competency in the Use of Google Apps for Education in Nigerian Universities. The questionnaire was a close-ended type, which contained a set of pre-determined options to the items presented. The items were structured using Likert Scale response format range from Advanced (A), Highly Competent (HC), Moderately Competent (MC), and No Competency (NC). This was represented by a four-point rating ranging from No Competency (1), moderately competent (2), highly competent (3) to Advanced (4) using a mean score benchmark of 2.5. Descriptive statistics involving frequency count, percentages and means were used to answer research questions 1, 2 and 3.

Data Analysis and Results

Table 3:

Number of Sampled Respondents

University	Total Population	Sample based on Israel Model (±3%) And Census	Remark
1. University A	1,915	700	Sampled
2. University B	450	450	Sampled
3. University C			
TOTAL	435	435	Sampled
	2,800	1,585	

Source: Field Study Result

Table 3 indicated the sampled Universities. Israel model was used to sample lecturers at University A while census sampling was adopted at Universities B and C. This made the total respondents sampled to be 1,585.

Research Question 1: Are University lecturers aware of the use of Google Apps for Education (GAfE)?

Table 4:

The Frequency Count and Percentage of Respondents on Lecturers' Awareness of GAfE

S/No	Items	No (%)	Yes (%)
1	I have heard about GAfE before	248 (25.9%)	711 (74.1%)
2	I have never heard about GAfE before	726 (75.7%)	233 (24.3%)
3	I am familiar with the concept of GAfE	535 (55.8%)	424 (44.2%)
4	I am just seeing the concept of GAfE for the first time	719 (75%)	240 (25%)
5	I heard about GAfE from a friend	804 (83.8%)	155 (16.2%)
6	I heard about GAfE Online	628 (65.5%)	331 (34.5%)
7	I heard about GAfE in a conference	639 (66.6%)	320 (33.4%)

8	I heard about GAfE in my school	664 (69.2%)	295 (30.8%)
9	I heard about GAfE on a Network news	829 (86.4%)	130 (13.6%)
10	I heard about GAfE from a colleague	560 (58.4%)	399 (41.6%)

Source: Field Study Result

Table 4 indicated that lecturers are aware of GAfE with 711 (74.1%) respondents out of a total of 959. It also reveals that the number of lecturers who were familiar with the concept of GAfE are 535 (55.8%). It can then be inferred that lecturers were aware of Google Apps for Education.

Research Question 2: Do University lecturers have access to Google Apps for Education?

This question sought to find out the lecturer's access to Google Apps for Education.

Table 5:

The Frequency Count and Percentage of Respondents on Lecturers' Access to Google Apps for Education

S/No.	Items	No (%)	Yes (%)
1	I have access to a computer at home	17 (1.8%)	942 (98.2%)
2	I have access to a computer in the office	27 (2.8%)	932 (97.2%)
3	I have access to a computer in the school library	460 (48%)	499 (52%)
4	I have access to a computer in the school laboratory	641 (66.8%)	318 (33.2%)
5	I have access to the Internet in the laboratory	605 (63.1%)	354 (36.9%)
6	I have access to the Internet at home	203 (21.2%)	756 (78.8%)
7	I have access to the Internet in the office	49 (5.1%)	910 (94.9%)
8	I have access to the Internet in the library	407 (42.4%)	552 (57.6%)
9	I have access to the Internet on my mobile phone	90 (9.4%)	869 (90.6%)
10	I have access to the Internet in the lecture room	497 (51.8%)	462 (48.2%)
11	I have access to the Internet anywhere on campus	497 (51.8%)	462 (48.2%)
12	I have access to the Internet through WIFI	177 (18.5%)	782 (81.5%)
13	I have access to the Internet through Fibre-optic cable	737 76.9%)	222 (23.1%)
14	I have access to GAfE in the laboratory	792 (82.6%)	167 (17.4%)
15	I have access to GAfE at home	591 (61.6%)	368 (38.4%)
16	I have access to GAfE in the office	428 (44.6%)	531 (55.4%)
17	I have access to GAfE in the library	712 (74.2%)	247 (25.8%)

18	I have access to GAfE on my mobile phone	563 (58.7%)	396 (41.3%)
19	I have access to GAfE in the lecture room	738 (77%)	221 (23%)
20	I have access to GAfE anywhere on campus	744 (77.6%)	215 (22.4%)

Source: Field Study Result

Table 5 revealed the percentages of respondents on lecturers' access to GAfE. Respondents' access to GAfE in the office was the highest with 531 (55.4%) while access to GAfE in the laboratory was lowest with 167 (17.4%). It can thus be inferred that most of the respondents only have access to GAfE in the office while access to it at home and other places in the academic area like mobile phone, home, library, lecture room, and other areas in the campus were 396 (41.3), 368 (38.4%), 247 (25.8), 221 (23%) and 215 (22.4%) respectively.

Research Question 3:

Are University lecturers competent in the use of Google Apps for Education?

This question sought to find out the lecturer's competent in using Google Apps for Education.

Table 6: Lecturers' Competency in the Use of Google Apps for Education

S/N	Items	N	Mean ($\bar{x}$)
1	I can send e-mail messages using Google Gmail Online	959	3.30
2	I can talk with video using Google Hangouts Online	959	2.17
3	I can create work in group using Google Hangouts Online	959	2.00
4	I can invite an expert into my class to do a guest lecture through Video Chat using Google Hangouts Online	959	1.66
5	I can share calendar schedule using Google calendar Online	959	2.14
6	I can use Google documents to collaborate Online	959	2.28
7	I can keep a running record of a lesson note using Google Vault Online	959	1.75
8	I can create folder for my documents using Google Vault Online	959	2.21
9	I can upload approved video clips to share during class time using Google Vault Online	959	2.02
10	I can store documents in the Google Drive Online	959	2.44
11	I can have students work collaboratively from anywhere using Google Classroom Online	959	1.92
12	I can give students instant feedback using Google Classroom Online	959	1.93

13	I can create classroom placement groups to better distribute differentiated materials and resources using Google Classroom Online	959	1.94
14	I can let students know that I will be available to help Online at a certain time using Google Classroom	959	1.97
15	I can have students reflect on their daily learning through Google Classroom Online	959	1.87
16	I can publish student work by sharing it within my class Online through Google Classroom	959	2.01
17	I can translate letters home to parents and guardians with their own language using Google Translator Online	959	1.72
18	I can use Sheets to track student homework with parents Online	959	1.60
19	I can collect data using Sheet Online	959	1.87
20	I can use Google Slides to dynamic presentations Online	959	1.95
	TOTAL (40.78/20)		**2.04**

Source: Field Study Result

Table 6 indicates that respondent competency in the 20 items are not good enough, based on the mean score benchmark of 2,04 respondents were believed to be competent in only six items, that is, item 1, 2, 5, 6, 8 and 10 with mean score 3.30, 2.17, 2.14, 2.28, 2.21 and 2.44 respectively. Item 18 contain the least mean score 1.60. The rest were below the benchmark score of 2.04. Examining the mean scores it can be deduced that respondents are not competency in the use of GAfE for instruction in Nigerian Universities.

The finding of this study based on the research questions were summarised as follows:

1. university lecturers were aware of GAfE (74.1%);
2. a total of 531 (55.4%) lecturers had access to GAfE in their personal offices while 44.6% had access to it at home and other places in the academic area like library, computer laboratory and classroom; and
3. lecturers were generally not competent in the use of GAfE as the observed grand mean of 1.96 was lower than the benchmark score of 2.5;

Discussions and Conclusion

Lecturers' awareness was addressed in the instrument comprises of ten items analysis varying from "I have heard about GAfE before" having the percentage of respondents on lecturers' awareness to be very high. Most of the respondents confirmed that they have heard about GAfE before. And for corroboration, the question was intervened in item 2 – "I have never heard about GAfE before", where most respondents confirmed that they have heard about GAfE before. Which also disclosed that the number of respondents who were familiar with the concept of GAfE was high. Most of the other respondents also responded that they were not seeing the concept of GAfE for the first time. Result was in agreement with Afolabi (2011) that, University lecturers were aware of Google Apps for Education.

The result revealed that most of the lecturers had no access to GAfE except in the office. That is, they had no access to GAfE in the laboratory, home, library, mobile phone, lecture room and most places on the campus. Thus access to GAfE by Nigerian University lecturers was limited and needed to be improved upon which was in agreement with Barbra (2011). It was also showed that most respondents did

not have access to a computer at home, office, library and laboratory. Correspondingly most respondents did not have access to an Internet in the school laboratory, home, mobile phone, lecture room and library. In the same way most respondents responded that they did not have access to GAfE in the library, mobile phone, lecture room and anywhere on campus. It can be deduced from the result that lecturers' access to Google Apps for Education in Nigerian Universities was limited.

The result on lecturers' competency in basic Google apps for education established that lecturers were not competent in the use of Google Apps for Education having compared the total mean score with the benchmark, it was noted that the total mean score was less than the benchmark. This agreed with Chris et al (2008) who worked on ICT resources and reported that many lecturers still fear some form of technology, which prevents them access and making use of them for teaching and research. This assertion is contrary to Barbra (2011) who revealed through the post survey results that indicated positive reactions to using Google Apps as a collaboration tool in the professional learning community (PLC).

The study indicated that most of the lecturers were aware of the use of GAfE but had limited access that warrant poor competency in handling some basic apps of GAfE. The success of lecturers teaching with GAfE depends largely on awareness, accessibility and competency in handling the new technology for academic use. It is of note that the decline in quality of education in Nigeria might not be unconnected with the traditional teaching techniques of lecturers (Ofolu, 2007; Musa; Ainol, 2014 & UNESCO, 2023). That may be one of the reason why sampled Universities embraced GAfE for communication and collaboration among lecturers so as to set the pace among others in Nigeria. Thus, GAfE has the potential of transforming the teaching processes to paperless and high performance in research, teaching and learning in Nigerian Universities if adequately used.

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

1. it was recommended that Nigerian university be licenced to enable lecturers use GAfE for teaching and learning. Opportunity should be created for them to use GAfE outside their offices without gender or status bias;
2. it was also recommended that ICT resources like, very high Internet connectivity with high bandwidth should be made available in Nigerian Universities for lecturers to have access to and harness GAfE opportunities available for them when the need arises; and
3. that training and re-training of lecturers be consistent with adequate information in other to leverage University lecturers' competency on the technology without gender or status bias.

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STUDENTS ACCEPTANCE OF E-LEARNING PLATFORMS IN THE DELIVERY OF INSTRUCTION IN UNIVERSITY OF ILORIN

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Abstract

The COVID-19 pandemic caused a significant disruption to traditional education systems globally, forcing institutions to adopt e-learning platforms. This study investigates the acceptance of e-learning platforms, specifically Google Classroom, Moodle, and Zoom, by undergraduate students at the University of Ilorin, Nigeria. It assesses students' perceptions of the ease of use, usefulness, attitudes, behavioral intentions, and challenges in using these platforms. A descriptive survey design was employed, and data were collected from 100 randomly selected students using a structured questionnaire. The findings reveal that while students find the platforms easy to use and beneficial for improving academic performance, they face challenges related to poor internet connectivity, lack of devices, and inadequate technical support. Despite these challenges, the students exhibited a positive attitude towards continuing the use of e-learning platforms beyond the pandemic. The study emphasizes the need for improved infrastructure and support to optimize the use of e-learning in Nigerian universities. Recommendations are made to enhance the effectiveness of these platforms for instructional delivery.

Keywords: Students Acceptance, instruction delivery, e-learning platforms, behavioural intentions; attitude

Introduction

The COVID-19 pandemic resulted in unprecedented challenges for the education sector globally, with many countries forced to close schools to curtail the spread of the virus. As a result, educational institutions had to rapidly transition from traditional face-to-face instruction to online learning modalities. In Nigeria, the impact was particularly profound due to the limited infrastructure available to support digital learning. In response, the Federal Ministry of Education directed tertiary institutions to adopt e-learning platforms as an alternative to in-person instruction.

At the University of Ilorin, platforms such as Google Classroom, Moodle, and Zoom were introduced to facilitate the continuation of academic activities during the lockdown. These platforms allowed educators and students to communicate, share resources, and engage in virtual learning environments. While these platforms provided an opportunity to mitigate the educational disruption, their adoption raised questions about the readiness of both students and faculty to effectively utilize such technologies for learning and teaching.

E-learning, broadly defined as the use of internet-based technologies to deliver instructional content, has become a crucial component of modern education systems. Studies have shown that e-learning platforms, when integrated properly, can enhance communication, facilitate interaction, and improve the overall learning experience. For example, research conducted by Shaharanee, Jamil, and Rodzi (2016) on the effectiveness of Google Classroom and other e-learning platforms in Malaysia revealed positive outcomes in terms of perceived ease of use, usefulness, and student satisfaction. Similarly, Liu and Chuang (2018)

found that students in Taiwan responded positively to the integration of e-learning technologies in their curriculum.

E-learning is a concept that has been defined in various ways by researchers in fields such as Information Communication and Technology (ICT), Science Education, and Educational Psychology. It is based on digital technology and refers to the use of any digital device for teaching and learning, especially for delivery or accessing content. E-learning is facilitated by ICTs and digital technologies and can be used to refer to both out-of-classroom and in-classroom educational experiences via technology.

However, the Nigerian context presents unique challenges. Despite government investments in Information and Communication Technology (ICT) tools and policies designed to improve education, many students and educators remain unfamiliar with the use of e-learning platforms. Several barriers have been identified, including poor internet connectivity, inconsistent electricity supply, and inadequate access to necessary devices. As Olatunde-Aiyedun et al. (2021) observed, students and lecturers in Nigeria have expressed concerns about the effectiveness of e-learning, given these infrastructural limitations.

Technical challenges such as unexpected computer/device breakdowns, inadequate internet access, expensive data subscription costs, and irregular power supply are significant obstacles to online teaching and learning in Nigerian institutions. Socio-economic issues, IT infrastructure challenges, and socio-cultural challenges also affect the adoption of E-learning in Nigeria. Socio-economic problems are caused by poverty and students' incapacity to purchase necessary internet data bundles for online learning.

The country's unequal socioeconomic position among students and indigents remains a challenge, as they struggle with financial and other challenges that limit their academic advancement. The existing minimum wage system and economic realities make it difficult for them to use the Internet for their academics. Other obstacles delimiting students' online learning experiences include differences in religious beliefs on the use of technologies in learning, terrorists and bandits vandalizing school facilities, government policy on Information Communication Technology (ICT) in education, curriculum review, insufficient funding to maintain ICT equipment in schools, and state and federal governments' inability to equip tertiary institutions with up-to-date ICT facilities and support to enhance teaching and learning with technology.

In the University of Ilorin, observations and informal discussions with students revealed a mix of opinions regarding the effectiveness and acceptance of e-learning platforms. Some students found that features such as the ability to access learning materials and receive feedback from lecturers were beneficial for their academic performance. Others, however, reported challenges, including difficulty accessing the platforms due to poor internet service, inadequate teaching methods, and a lack of essential ICT tools.

The shift to e-learning, while necessary, has highlighted the gaps in digital infrastructure and readiness in Nigerian universities. This study, therefore, seeks to assess the acceptance of e-learning platforms by students at the University of Ilorin. Specifically, it will explore students' perceptions of the ease of use, usefulness, and overall attitudes toward Google Classroom, Moodle, and Zoom. By identifying the factors that influence the acceptance of these platforms, the study aims to provide insights that can guide the improvement of e-learning strategies and infrastructure in Nigerian higher education institutions.

The University of Ilorin serves as a relevant case study, as it was one of the institutions in Nigeria that quickly adapted to e-learning during the COVID-19 pandemic. This makes it a valuable context for understanding the broader implications of e-learning acceptance in Nigerian tertiary institutions. As the world transitions into a post-pandemic era, the lessons learned from this study could inform the development of more resilient and inclusive e-learning strategies that cater to the diverse needs of students in Nigeria and beyond.

Purpose of the Study

The purpose of this study is to investigate the acceptance of e-learning platforms by students at the University of Ilorin. Specifically, it aims to:

1. Assess students' perceived ease of use of e-learning platforms.
2. Examine the perceived usefulness of these platforms for learning.
3. Explore students' attitudes towards the use of e-learning platforms.
4. Investigate students' behavioral intention to use e-learning platforms.
5. Identify the challenges students face in using e-learning platforms for learning.

Research Questions

1. How do students perceive the ease of use of e-learning platforms at the University of Ilorin?
2. How useful do students find e-learning platforms in enhancing their learning?
3. What are students' attitudes toward using e-learning platforms for instructional delivery?
4. What is the behavioural intention of students to continue using these platforms?
5. What challenges do students encounter when using e-learning platforms?

Methodology

This study employed a descriptive survey research design. The population comprised undergraduate students at the University of Ilorin, with a sample of 100 students selected using stratified sampling. A researcher-designed questionnaire was used to gather data on students' acceptance of e-learning platforms. The questionnaire was divided into sections to capture demographic information, perceived ease of use, usefulness, attitudes, behavioural intentions, and challenges. Data were analysed using descriptive statistics (frequency counts, percentages, and mean) and inferential statistics (t-tests) to compare responses across gender.

Findings and Discussions

Research Question 1: How do students perceive the ease of use of e-learning platforms in the delivery of instruction?

Table 1: Perceived Ease of Use Of E-Learning Platforms Among University of Ilorin Students

S/N	Items	Mean	SD
1.	The interaction with E-learning platforms is clear and understandable	3.32	0.60
2.	It is easier to learn with the use of the E-learning platforms	3.15	0.57
3.	It is easy to operate the E-learning platforms	3.05	0.64
4	The E-learning platforms are flexible to interact with	3.05	0.43

S/N	Items	Mean	SD
5	It would be easy to be skilled in the use of E-learning platforms	2.79	0.43
6	I consider that the E-learning platforms are easy to use	3.05	0.57
	Grand Mean	**3.06**	

Perceived ease of use of the E-learning platforms among undergraduate student of the University of Ilorin was investigated and the result is presented in table 1. It depicted that most of the students find interaction with the E-learning platforms to be clear and understandable with a mean score of 3.32. It is also depicted that majority of the respondents find it is easier to learn with the use of E-learning platforms with a mean score of 3.15. In addition, with a mean score of 3.05, it is indicated that majority of the respondents perceive the E-learning platforms easy to operate. Others followed suit as shown in table 3. The grand mean score of 3.06 helps to establish that majority of undergraduate students in University of Ilorin agree that E-learning platforms are easy to use.

The findings revealed that the majority of students found the e-learning platforms (Google Classroom, Moodle, and Zoom) to be user-friendly and easy to navigate. Google Classroom, in particular, was perceived as straightforward, with its integration of familiar tools like Google Drive, making it easier for students to access and manage learning materials. Moodle and Zoom were also considered easy to use, though some students reported occasional technical difficulties with Zoom, such as issues with connectivity during live sessions.

Research Question 2: How useful do students find e-learning platforms in enhancing their learning?

Table 2: Students Perceived Usefulness of Use Of E-Learning Platforms

S/No	Items	Mean	SD
1	It is useful for learning coursework's effectively	3.11	0.54
2	It achieves learning in a faster way	3.03	0.48
3	It improves learning and academic performance	3.05	0.59
4	It is useful for general learning	3.06	0.61
5	It eases teacher-learner communication effectively	3.07	0.62
6	It makes educational materials easily accessible for learning	3.05	0.53
	Grand mean	3.06	

Students generally perceived the e-learning platforms as useful in enhancing their learning experience. The platforms enabled them to access course materials remotely, submit assignments on time, and interact with lecturers and peers in real time. This flexibility allowed students to learn at their own pace, which they found particularly beneficial. The ability to record and review lectures on Zoom further improved comprehension and retention, making the platforms an essential tool for academic success.

Research Question 3: What are students' attitudes toward using e-learning platforms for instructional delivery?

Table 3: Students Attitude Towards the Use Of E-Learning Platforms For Learning

S/No	Items	Mean	SD
1	It is important to use the E-learning platforms	3.08	0.59
2	It makes me reluctant towards attending classes, completing quizzes and assignments.	2.43	0.70
3	I am motivated to use E-learning platforms regularly	3.07	0.45
4	It makes me lazier towards coursework	2.01	0.73
5	The E-learning platform is too difficult to use	2.16	0.64
6	I don't understand the lectures when E-learning platforms are used	2.23	0.70
	Grand mean	2.50	

The attitude of students towards e-learning platforms was overwhelmingly positive. Many students expressed that they appreciated the convenience and flexibility of e-learning, which allowed them to balance their studies with other responsibilities. There was a strong consensus that e-learning platforms were valuable tools that could complement traditional face-to-face instruction, even after the pandemic. Despite some initial resistance due to unfamiliarity with the platforms, students quickly adapted and became comfortable with using them.

Research Question 4: What is the behavioural intention of students to continue using these platforms?

Table 4: Students Behavioural Intention to Accept the Use of E-learning Platforms for Learning

S/No	Items	Mean	SD
1	I am pleased to use the platforms as a learning tool	3.12	0.51
2	I tend to use the platforms frequently	2.92	0.27
3	I can complete learning tasks in the E-learning platforms if no one is around to tell me what to do	3.02	0.60
4	I want E-learning platforms to be adopted for instructional delivery in my next semester	3.14	0.37
5	I will use the E-learning platforms in all my courses	2.59	0.76
6	I find E-learning platforms difficult to use	2.13	0.54
	Grand mean	2.82	

The study found that students were open to continuing the use of e-learning platforms in the future. Behavioral intention to use the platforms was high, with most students indicating that they would like to see these platforms integrated into regular academic activities, even after the resumption of physical classes. The flexibility and accessibility offered by the platforms were key factors driving this intention, as students felt that e-learning could enhance their overall educational experience.

Research Question 5: What challenges do students encounter when using e-learning platforms?

Table 5: *Challenges Faced* with the Actual Use of E-learning Platforms for Learning

S/No	Items	Mean	SD
1	Adoption of E-learning technology reduced interaction with the teacher	2.87	0.67
2	Little or no technical know-how of how E-learning platforms works	2.31	0.73
3	Inadequate studying environment or distractions at home	3.0	0.80
4	Lack of self-discipline and motivation	2.93	0.67
5	Social isolation	2.96	0.58
6	Unclear instruction on assignments, exams, and/or quizzes	2.87	0.64
7	Unstable electricity supply	3.25	0.57
8	Personal preference for face-to-face learning	2.61	0.54
9	Internet connectivity issues	3.55	0.50
	Grand mean	**2.92**	

Several challenges were identified that hindered the full utilization of e-learning platforms. Poor internet connectivity was the most significant barrier, with many students reporting frequent disruptions during live sessions on Zoom. High data costs were another major concern, as students had to purchase data to access learning materials and attend virtual lectures. Additionally, some students lacked access to adequate devices, such as laptops or smartphones, which limited their ability to fully engage with the platforms. Finally, the lack of technical support made it difficult for students to troubleshoot issues they encountered while using the platforms.

Conclusion and Recommendations

The study concluded that students at the University of Ilorin have generally accepted e-learning platforms as a viable means of instructional delivery. However, for these platforms to be more effective, it is essential to address the challenges related to infrastructure and technical support. The study recommends that the

university administration collaborate with the government to improve internet access, provide training for both students and staff, and ensure the availability of necessary technological devices. Further research could explore the long-term impact of e-learning on academic performance and the integration of more interactive features in e-learning platforms.

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