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INFLUENCE OF BLENDED TEACHING STRATEGIES ON TEACHING EFFECTIVENESS IN GOVERNMENT OWNED POLYTECHNICS IN ANAMBRA STATE, NIGERIA.

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ABSTRACT

Education is a fundamental pillar for national development, technological advancement and socio-economic transformations. Blended teaching has the potentials to revolutionize higher education by enhancing academic performance, improve student engagement especially polytechnics because of its role in producing technical skilled manpower required for industrial growth, entrepreneurial development and innovation driven economies. The motivation for the study emanated due to lingering issues and educational concerns bordering on declining academic performance, limited instructional innovation and inadequate integration of educational technologies experienced in government owned polytechnics in Anambra State, Nigeria. These challenges have therefore hindered the quality of education in these government owned polytechnics. The introduction of blended teaching has therefore changed the narrative because it is an advanced tool which has the capacity to improve students' academic performance and engagement. Therefore, this research work investigated how teaching effectiveness could be enhanced in government owned polytechnics through blended teaching strategies. Specifically, the study examined how learning management system enhances accountability and transparency in administrative, academic and financial operations in tertiary institutions in southeastern, Nigeria. The study also investigated how AI driven automated grading systems fosters accountability and transparency in selected tertiary institutions in southeastern, Nigeria. Thirdly, the study also ascertained how artificial intelligence driven chatbots can enhance accountability and transparency in selected tertiary institutions in southeastern, Nigeria. Accordingly, the study adopted a descriptive research design using a survey method to source the needed data from the respondents. The target population of the study consist of the staff and management of the selected tertiary institutions in south eastern part of Nigeria. Partial least square structural equation modelling (PLS-SEM) was used to test the hypotheses formulated to guide the study at 5% level of significance. The findings of the study revealed that personalized learning, automated grading system and AI powered chatbots significantly and positively enhance accountability and transparency in higher institutions in southeastern, Nigeria. The study recommended that tertiary institutions should engage more on personalized learning platforms such as Goggle Classroom, Class54 etc. for tailored content to meet students' academic needs. The study recommended that tertiary institutions in Nigeria should be more engaged on automated grading system systems such as Gradescope, Custom AI in order to reduce bias in assessment thereby promoting accountability through standardized auditable trail. The study also recommended that AI powdered chatbots should be deployed more in tertiary institutions in order to enhance accessibility and responsiveness in tertiary institutions in Nigeria. The study suggests that further studies could be done on the effect of artificial intelligence on accountability and transparency in other areas such as deposit money banks, government parastatals, FINTECH Companies, Corporate organizations etc. The study is expected to offer both managerial and practical implications to various stakeholders such as technology developers, the management of tertiary institutions, Policymakers, students, academia, future researchers, government and even the general public.

Keywords: Artificial intelligence, accountability, transparency, tertiary institutions, Nigeria.

1. Introduction

Education is the mainstay of any economy and a powerful instrument for national development, technological advancement and socio economic transformation. In Nigeria, tertiary institutions especially polytechnics play a critical role in producing technically skilled manpower required for industrial growth, entrepreneurial development and innovative driven economies. Polytechnics are specially structured to provide practical, technical and vocational education aimed at bridging the gap between theoretical knowledge and industrial application. The emergence of information and communication Technology (ICT) has transformed various sectors globally, including the education sector. Technological innovations such as learning management Systems (LMS), virtual/ online classrooms, online collaborative tools, multimedia instructional resources and digital assessment platforms have reshaped how knowledge is delivered and acquired. This transformation has given rise to blended innovative teaching which combines traditional face to face instruction with digital and online components representing a paradigm shift from the conventional methods of teaching. This hybrid model incorporates elements such as multimedia resources, learning management systems (LMS) like Moodle, gamification, flipped classrooms and interactive online platforms which enhances student centered learning. Blended teaching is a strategic integration of face to face instruction with technologically enhanced learning practices in a way that leverages both traditional and digital pedagogies. Blended innovative teaching has redefined how instructional content is delivered in tertiary institutions all over the world (Graham, 2019). The demand for blended innovative teaching is transformative and there is an urgent call to integrate it into the education system for improved academic performance and to meet up with global standard of education(Adewale & Okeke, 2020).

Nigerian tertiary institutions has over the years relied on traditional lecture based methods which has predominately being criticized because of its limiting challenges ranging from passive learning, low student engagement and poor learning outcomes (Obi & Nwachukwu, 2018).The National Policy on Education (2013) emphasized the need for open and distance learning to eliminate this trajectory in order to promote lifelong learning, skill development and national unity. The COVID 19 pandemic also accelerated the adoption of blended learning in tertiary institutions in Nigeria as most tertiary institutions shifted to hybrid (blended) modes to maintain continuity. Institutions like the National Open University, University of Lagos and University of Ibadan pioneered the trend of blended learning through initiatives like Partnership for Enhanced and Blended Learning (PEBL).Blended teaching has the potentials to enhance flexibility, improve engagement, critical thinking and practical skills for enhanced academic performance. Empirical studies suggest that blended innovative teaching approach could yield about 10-25% higher achievement in courses such as business education, electronics and mathematics when compared to traditional method of teaching.

Teaching effectiveness in polytechnics encompasses multiple dimensions, including clarity of instruction, student engagement, assessment practices, learning outcomes, practical skill acquisition, and the ability to integrate theory with practice. Effective teaching is central to achieving institutional objectives, enhancing students' employability, and ensuring compliance with accreditation standards set by NBTE. Blended teaching strategies present a potential solution to many of these challenges. Through digital content delivery, asynchronous learning modules, virtual laboratories, online assessment tools, and collaborative platforms, lecturers can extend learning beyond the classroom, provide individualized feedback, and enhance instructional efficiency. Furthermore, blended teaching may promote active learning, self-directed study, critical thinking, and improved student–lecturer interaction. Despite the theoretical advantages of blended teaching, its actual

influence on teaching effectiveness within government-owned polytechnics in Anambra State remains under-explored. While anecdotal evidence suggests increasing adoption of digital tools such as Google Classroom, Zoom, Moodle, and other LMS platforms there is limited empirical research assessing whether and to what extent these blended strategies translate into measurable improvements in teaching effectiveness. Given the strategic importance of polytechnics in Nigeria, there is pressing need for systematic institutional-based research to evaluate the relationship between blended teaching strategies and teaching effectiveness on government-owned polytechnics in Anambra State.

1.2 Statement of the problem.

The quality of tertiary education in Nigeria has predominately become a subject of concern due ineffective teaching methods, low student engagement, poor instructional clarity, weak classroom management and declining academic performance. Despite the growth and increase in enrollment of students in several tertiary institutions in Nigeria, instructional delivery in these tertiary institutions are still traditionally based which has promoted passive learning, limited critical thinking and has not meet the needs of diverse learning styles of students (Obi & Nwachukwu, 2018). Globally, blended teaching has emerged as a transformative instructional strategy that combines the face to face teaching with technology-assisted learning environments (Graham, 2019). Studies in developed context show that blended learning enhances students' engagement, increase retention and positively influences academic performance (Means et al, 2013). The integration of digital tools such as Learning Management systems (LMS), multimedia resources, flipped classrooms and online assessments has been found to foster deeper learning and flexibility (Bonk & Graham, 2020)

In Nigeria, educational reforms and national policy framework have emphasized the need to integrate information and communication technology (ICT) into tertiary education to improve quality and access. However, implementation of blended innovative teaching remains uneven and has faced multiple challenges such as inadequate infrastructure, unstable power supply, poor internet connectivity and limited access to digital learning resources (Ajayi, 2021). These infrastructural deficiencies hinder effective integration of innovative teaching strategies. Furthermore, lecturers' digital competence and pedagogical readiness significantly influence the success of blended learning implementation. In many tertiary institutions, there is a problem of insufficient training and resistance to technological change which has slowed the adoption of blended innovative teaching approaches. On the path of the students, there arise differences in digital literacy levels, socio-economic background and limited access to personal learning devices which do not provide a friendly environment for blended learning to strive. The COVID 19 pandemic further recalibrated the unpreparedness of some tertiary institutions who struggled to transit from traditional teaching to online and blended modes (Onyema et al., 2020). The situation calls for emergency response to address these concerns which has perpetuated declining educational quality, reduces graduate employability and has limited global competitiveness of the Nigerian tertiary institutions. Nigerian tertiary institutions have been called upon on the need for sustainable blended instructional models beyond traditional or remote teaching.

According to some scholars (Nouri, 2016; Ugwu, 2023; Tang, Zhang & Jiang, 2022),who found out that blended teaching strategies positively correlates with improved teaching effectiveness. Empirical evidence within the Nigerian context on examining the direct relationship between blended teaching strategies and measurable academic performance indicators such as Grade Point Average (GPA), examination scores and course completion rates are still limited. Given this challenges and uncertainties, there is a pressing need for

empirical investigation to determine the extent of the impact of blended teaching strategies on teaching effectiveness in government owned polytechnic in Anambra State, Nigeria.

1.3 Objectives of the study.

The primary objective of the study will be to examine the effect of blended teaching strategies on teaching effectiveness in government owned polytechnics in Anambra State, Nigeria. Specifically, the study will aim to:

1. Determine the extent to which learning management system influences teaching effectiveness in government owned polytechnics in Anambra State, Nigeria
2. Investigate the influence of flipped classroom strategy on teaching effectiveness in government owned polytechnics in Anambra State, Nigeria
3. Examine the effect of online assessment and feedback on teaching effectiveness in government owned polytechnics in Anambra State, Nigeria

1.4 Statement of Hypotheses

The following hypothesis will be formulated in their null structure

Ho1: What is the extent of influence of learning Management System on teaching effectiveness in government owned polytechnics in Anambra State, Nigeria?

Ho2: How does flipped classroom affect teaching effectiveness in government owned polytechnics in Anambra State, Nigeria?

Ho3: What is the effect of online assessment and feedback on teaching effectiveness in government owned polytechnics in Anambra State, Nigeria?

1.5 Significance and Scope of the Study.

The study will provide empirical evidence for policymakers on blended teaching in government owned polytechnics. The study will inform institutional leaders on the pedagogical transformation which will be of immense benefit to students and will also guide lecturers on the effective instructional strategies for improved learning outcomes. The scope of the study consist of two government owned polytechnics in Anambra State, Nigeria namely: Federal Polytechnic, Oko and Anambra State Polytechnic, Mgbakwu

2. RELATED LITERATURE

2.1 Conceptual Review

2.1.1 Blended Teaching

Blended teaching has increasing gained popularity in recent times due to the increased prevalence of digital technologies in teaching and learning. Blended forms of teaching have become increasingly popular (Garrison & Kanuka, 2004; Garrison & Vaughan, 2008; Graham, 2006). Blended teaching is commonly considered as an instructional model that employs different media and takes place on different time scales (synchronous, asynchronous) with the face-to-face (f2f) method of instruction (Roseth, Akcaoglu, & Zellner, 2013). Blended Teaching combines f2f learning with an online learning style, where 30–79% of the content is delivered online (Graham, 2006). Pereira et al. (2007) defined blended teaching as a teaching modality which is the synergic combination between attendance-based distance teaching or traditional classroom-based teaching and non-attendance-based distance teaching or e-learning. Meanwhile, Garrison and Vaughn (2008, p.148) state that blended teaching is the organic integration of thoughtfully selected and complementary face-to-face and online approaches and technologies. Alternatively, Blended Teaching can also be considered a useful mixture of technology-based and classroom-based teaching methods that allow students to gain complementary experiences through being

proficient in using IT tools for study purposes and to acquire more helpful knowledge by doubling the instructions of teachers from online to face to face classes.It is a teaching strategy also known as semi-attendance-based teaching (Pereira et al., 2007). In addition, it is also called a hybrid course delivery method. However, due to the wide recognition, the term 'blended' teaching is used for the whole study. Indeed, although there is no official definition of blended teaching, the majority of its definitions are given by researchers. Gilbert and Flores-Zambada (2011) used to state that blended teaching is a method conjoining all of the greatest aspects of online and on- ground instruction. Pereira et al. (2007) defined blended teaching as a teaching modality which is the synergic combination between attendance-based distance teaching or traditional classroom-based teaching and non-attendance-based distance teaching or e-learning. The definition of Garrison and Vaughn (2008) is that blended teaching "is the organic integration of thoughtfully selected and complementary face-to-face and online approaches and technologies". In a short way, blended teaching is generally considered a combination of online and face to face instruction (Graham, 2006).

It is defined as the deliberate integration of traditional face-to-face classroom instruction with online or computer-mediated learning experiences to create an ideal learning environment. Agha (2023) defines blended learning as "the blended learning of the two approaches to form a blend" that "bridges the gap between the fully online learning approach and the conventional classroom approach." It is further described as "a computer-mediated instructional strategy that leverages technology and focuses on the student-teacher relationship to enhance independence, engagement and achievement" (Ukamaka, 2018). In practice, it involves combining blog and Google classroom with face-to-face physical co-presence of teacher and students. Anyakoha and Okanazu (2013) define blended learning as "a combination of classroom learning and online learning which is a student-centered form of teaching and learning, aimed at catering to the diverse assimilation rates and learning styles of students." Garrison and Kanuka (2004) described it as combining internet with digital media and classroom teaching method to bring about optimal level of program delivery and increase level of student interest in the subject area. Ndanwu et al. (2023) conceptualized blended learning strategies as a combination of classroom learning activities and multimedia resources in teaching and learning process which combines the best features of classroom interaction and multimedia based teaching method. (Mbonu, 2018) opined that it is an interesting instructional strategy whereby students receive instruction through online, media/instructor or digital resources and traditional based classroom method. Margaret and Umeano (2025) define blended learning as a learning style that combines face-to-face instruction with computer-mediated instruction to leverage learning for students, aided by electronic media where all teaching activities can be done using electronic means. Specific implementation strategies in Anambra higher institutions include uploading pre-recorded lessons, video conferencing (mean = 3.09), discussion boards, and synchronous presentations. In this institutional-based study, blended teaching strategies are operationally defined as the utilization of flex model (students work online at their own pace with occasional face-to-face support) and enriched virtual model (primarily online with infrequent face-to-face sessions) by lecturers in government-owned polytechnics in Anambra State.

2.1.2 Learning Management System(LMS)

The integration of technology in education has transformed traditional classrooms into dynamic environments that support flexible, interactive, and scalable learning. Central to this transformation is the adoption of Learning Management Systems (LMS) software platforms designed to facilitate course delivery, student engagement, assessment, and instructional

management (Al-Busaidi & Al-Shihi, 2012). A Learning Management System is defined as a web-based software application for creating, managing, and delivering digital learning content. LMS platforms include functionalities such as: Content organization and delivery, Communication tools (forums, messaging) Online assessments and grading and Activity tracking and analytics. Examples of learning management systems include Moodle, Blackboard, Canvas, and Google Classroom systems used widely by universities and polytechnics globally for both fully online and blended instruction (Liaw, 2008). Learning Management Systems represent powerful tools for enhancing teaching effectiveness in higher education. They offer structured content delivery, enable dynamic interaction, facilitate timely feedback, and provide analytics for instructional improvement. However, their impact depends on effective integration, institutional readiness, and the pedagogical competence of educators. To maximize the benefits of LMS, universities and polytechnics must invest in training, infrastructure, and instructional support ensuring that LMS platforms serve as enablers, not simply technology repositories.

2.1.3 Flipped Classroom

Flipped Classroom is a student-centered learning strategy consisting of interactive learning activities during instruction and individual teaching based on computers outside of lesson (Bishop and Verleger, 2013). Mull (2012) described as a Model that lets the students prepare themselves for the lecture by watching videos, listening to podcasts, and reading articles. Thus, it is just the idea that children complete their homework at school and their schoolwork at home. The term "flipped classroom" refers to a method of teaching where students watch brief video lectures from home before to class and spend the actual class time working on exercises, projects, or debates. The Flipped Classroom approach prioritizes the students, and the instructor takes on the role of "guide on the side" rather than "sage on the stage," Baker (2000). Pinnelli and Fiorucci (2015) support and elaborate this statement by stating that the flipped Classroom idea is a good way to encourage democratization of education since it gives students the freedom to see the lecture videos whenever and wherever they want before class. In Flipped classroom, direct instruction is passed to the individual learning space rather than the group learning approach. This approach creates learning atmosphere in a very dynamic and interactive manner where the role of teacher is to teach the concepts with their applications and creativity in their teaching learning process.

2.1.4 Online assessment/Feedback

Online assessment is defined as a systematic method of gathering information or artifacts about a learner and learning processes to draw inferences about the person’s dispositions using information and communication technology (Heil&Ifenthaler, 2023). It includes formative tools (quizzes, discussion boards, e-portfolios) and summative tools (proctored exams, automated grading). In Nigerian polytechnics, common forms are Google Forms quizzes, Moodle-based tests, and portfolio submissions. Online assessment involves digital tools for formative (quizzes, assignments) and summative (exams) evaluations, often using platforms like Moodle, Google Forms, or dedicated CBT systems. It promises efficiency but faces barriers in polytechnics' practical-oriented context. Gikandi, Morrow and Davis(2011) opined that online assessment is the use of digital technologies to design, deliver and evaluate students learning in ways that support interaction, feedback and self-regulation within online and blended environments. Redecker and Johannessen (2013) defined online assessment as technology enhanced evaluation processes that utilize digital tools to measure learners knowledge, skills and competencies in formal education settings. Online assessment is a

computer mediated testing systems designed to measure academic achievement using automated scoring and digital response collection methods (Bennett, 2012). Online assessment refers to the use of digital platforms to administer, grade and provide feedback on students' academic work. In tertiary institutions, online assessment includes: computer based tests (CBT), Online quizzes, E-assignments, Discussion forum participation grading, E-portfolio. Online assessment enhances flexibility and provides instant analytics for monitoring student progress

2.1.5 Teaching Effectiveness.

Teaching effectiveness refers to the extent to which instructional practices achieve intended learning outcomes, including student academic achievement, engagement, retention, and overall quality of instructional delivery.Agha (2023) measures teaching effectiveness through the successful utilization of blended strategies that make teaching interesting and participatory for both students and instructors. Effectiveness is evidenced by enhanced student engagement (online discussion boards, synchronous/asynchronous interaction) and achievement (self-paced learning). Anyakoha and Okanazu (2023) link teaching effectiveness to improved student assimilation of knowledge, higher level of interest, task performance, quality of assignments, and curriculum innovation in entrepreneurship education. Blended learning results in a higher level of student achievement and increases student satisfaction by allowing self-paced and collaborative learning. Ndanwu et al. (2023) operationalized teaching effectiveness through students' academic achievement in Internet and Electronic Libraries, measured via pre-test and post-test scores on the Internet and Electronic Libraries Achievement Test (IELAT). Blended learning strategy produced significantly higher post-test mean (67.06) and gained mean (17.65) compared to non-blended (55.00 and 12.18), with ANCOVA confirming statistical significance ($F = 7.303$, $p = 0.009$). It was particularly more effective for female students. Margaret and Umeano (2025) define effective instructional delivery (as a proxy for teaching effectiveness) as the various methods or approaches a professional teacher adopts to explain lessons for learner understanding the instructional process based on stated lesson objectives. In the work of Ofor, 2022 in Anambra state, blended learning enhances effectiveness by ensuring uninterrupted activities during disruptions (mean benefits = 3.07), progress tracking (mean = 3.09), and digital skill development, while challenges like power supply (mean = 3.32) and lecturer digital skills (mean = 3.35) affect outcomes. Operationally, in this study, teaching effectiveness will be measured by students' academic performance (CGPA or course scores), engagement levels, knowledge retention, and lecturers'/students' perceptions of instructional quality in blended environments within the two Anambra polytechnics.

2.2 Theoretical Framework

The study is anchored on Community of Inquiry (Col)

The study is anchored on the Community of Inquiry (CoI) Framework by Garrison , Anderson and Archer(2000).The framework posits that effective teaching and learning in blended environments result from the intersection of three core elements: teaching presence (design and facilitation), social presence (emotional connection), and cognitive presence (construction of meaning). The community of Inquiry framework directly explains how blended teaching strategies influence teaching effectiveness. When lecturers effectively integrate online and face to face instruction, they strengthen teaching presence, foster social presence and stimulate cognitive presence leading to improved instructional delivery, student

engagement and academic performance. Thus teaching effectiveness as the outcome of a well-balanced interaction among the three presence. The study therefore proposes that effective implementation of blended teaching strategies strengthen teaching presence, social presence and cognitive presence which in turn enhances teaching effectiveness in government owned polytechnics.

2.3 Review of related literature

Gambari et al. (2017) investigated the effectiveness of blended learning and e-learning instructional modes on undergraduate students' performance in Kwara State, Nigeria. The researchers adopted a quasi-experimental pretest–posttest control-group design involving 30 students divided among three instructional groups. Data were analysed using analysis of covariance and Scheffé post-hoc tests. The findings indicated statistically significant differences among the groups, with the blended-learning group recording higher performance than the e-learning and traditional teaching groups. The study recommended institutional support for blended learning. Vo et al. (2017) conducted a meta-analysis examining the effect of blended learning on student performance at course level in higher education. The study synthesised 51 effect sizes comparing blended learning with traditional classroom instruction. The results indicated a positive overall effect of blended learning on student performance, with differences across academic disciplines. The reported effect was larger in science, technology, engineering, and mathematics disciplines than in non-STEM disciplines. This study provides broader evidence that combining instructional approaches can be associated with improved academic performance. Asuzu, Nwanua, and Atsenuwa (2025) examined blended learning in Nigerian polytechnics, focusing on institutional readiness, teacher and student perceptions, and implementation challenges in South-South Nigeria. The researchers adopted a mixed-method approach involving surveys, interviews, and observations across selected polytechnics. Their paper identified infrastructural limitations, digital literacy gaps, and insufficient institutional support as important challenges to the implementation of blended learning. The authors recommended improvements in ICT infrastructure, staff and student training, and institutional collaboration. A study by Obi and Akudolu (2025) examined the integration of emerging technologies into teaching and learning in Office Technology and Management programmes at public polytechnics in South-East Nigeria. The researchers adopted a descriptive survey design involving 48 lecturers from five public polytechnics. Data were collected through a structured questionnaire and analysed using mean, standard deviation, and t-tests. The findings indicated that learning management systems were integrated to a great extent, whereas adaptive learning systems and flipped-classroom technologies were integrated to a smaller extent. The researchers recommended increased awareness and training on emerging instructional technologies.

Osakpa et al. (2018) examined differences in the teaching effectiveness of lecturers who obtained their initial business education qualifications from polytechnics or universities before acquiring higher degrees. The study used a descriptive survey design involving students and lecturers associated with Federal Polytechnic Nekede, Owerri, and Nnamdi Azikiwe University, Awka. Teaching effectiveness was evaluated using a teaching-effectiveness rating instrument, and the data were analysed using Spearman's rank-order correlation. The authors reported differences in student-rated teaching effectiveness associated with lecturers' educational backgrounds and recommended professional development opportunities for lecturers. Odunlade (2012) investigated information-resource utilisation and teaching effectiveness among lecturers in federal polytechnics in Nigeria. The study covered 46 lecturers and 1,365 Higher National Diploma II students across 12 federal

polytechnics. Using questionnaires, descriptive statistics, Pearson product-moment correlation, and multiple regression, the research examined information-resource utilisation and lecturers' teaching effectiveness. The findings indicated that information-resource utilisation made a positive contribution to teaching effectiveness, while accessibility of information resources was identified as an important predictor. The study recommended improved access to electronic resources and supporting infrastructure. Oyinloye and Mamman (2018) investigated lecturers' perceptions of the skills required to transition from classroom-based to online teaching and learning in polytechnics in Nigeria's North-Central zone. The researchers employed a descriptive survey design involving 329 lecturers. Data were collected using a structured questionnaire and analysed using mean, standard deviation, t-tests, and analysis of variance. The findings identified technical, internet, keyboarding, software, and communication skills as important requirements for online teaching. The authors recommended appropriate training for lecturers and institutional support for the development of relevant skills. Agim, Igwe, and Olannye (2025) examined lecturers' perspectives on improving instructional delivery through blended learning in colleges of education in South-South and South-East Nigeria. The researchers adopted a descriptive survey design involving a reported population of 425 business education lecturers. The study focused on how blended learning could improve instructional delivery. Its relevance to the present research lies in the connection between blended teaching and lecturers' instructional practices. However, the study concerned colleges of education rather than government-owned polytechnics and should not be treated as direct evidence of effects on teaching effectiveness in the proposed study.

3. Methodology.

This work adopted a descriptive research design using a survey method. The population of the study comprised the staff of the all government owned Polytechnics in Anambra State namely; Federal Polytechnic Oko, Anambra State and Anambra State Polytechnic Mgbakwu. The population size was 1550 while the sample size is 318 determined using a Taro Yamane formula. The study adopted a **s**imple random sampling technique. Primary source of data was used and sourced from the respondents. The questionnaire was used as the instrument for data collection. Likert scale was adopted and modified to suit the context of the present study. The validity and reliability of the research instrument was done. The reliability value = 0.7032 established the internal consistency of the measuring instrument. The researcher employed three field research assistants for the field survey. The formulated hypotheses were tested using multiple regression analysis at 5% level of significance. In addition, out of 318 copies distributed; only 308 valid copies were used in the analysis. The model for this study was specified as follows: TE = a+ βLMS + β2FLC + β3ONAF + e Where; TE = Teaching Effectiveness, a = constant, β1-β3 = coefficient of the parameters; e = error term. LMS = Learning Management System, FLC = Flipped classroom strategy, ONAF = Online assessment and feedback. Furthermore, the decision rule is to accept HO and reject the HA if the p-value is greater than 0.05. Or to reject the null hypothesis and accept the alternative hypothesis if the p-value is less than or equal to 0.05; the stipulated level of significance for this study.

4. RESULTS

The analysis was based on 318 valid copies of the instrument. Partial least square structural equation modeling statistical technique was used to test the significance of the model using bootstrapping procedure. The coefficient of determination (R^2) is 0.785 (78.5%) which is clearly above the threshold as given by (Hair, Hult, Ringle, & Sarstedt, 2017). For the test of

hypotheses, the significance as well as the extent of effect were estimated based on the values of the statistical t-values and the p-values as well as the path coefficients of the structural equation model.

Table 1: The PLS Results

Hypotheses	Hypotheses paths	Coefficients	T-values	P-values	Remarks
H1	LMS -> TE	0.847	10.531	0.000	Significant and positive effect
H2	FLC -> TE	0.945	6.835	0.002	Significant and positive effect
H3	ONAF-> TE	0.653	5.667	0.004	Significant and positive effect

Note: Path coefficient is significant at 5% level of significance; t-value ≥ 1.96, or p-value ≤ 0.05.

LMS =Learning Management System; FLC =Flipped classroom strategy;
ONAF = Online assessment and feedback; TE = Teaching Effectiveness.
Source: PLS-SEM Output, 2026.

A careful examination of the results on table 1, shows that Learning management system has a significant and positive effect on teaching effectiveness (β= 0.847, t=10.531and p = 0.000 < 0.05). Therefore, the null hypothesis one (HO1) is rejected and alternative hypothesis one (HA1) is accepted which states that learning management system has a significant and positive effect on teaching effectiveness of government owned Polytechnics in Anambra State, Nigeria. Table 1, also shows that Flipped classroom strategy has a significant and positive effect on sustainable development (β = 0.945, t = 6.835 and p = 0.002 < 0.05). Therefore, the null hypothesis two (HO2) is rejected and alternative hypothesis two (HA2) is accepted which states that flipped classroom strategy has a significant and positive effect on teaching effectiveness in government owned polytechnics in Anambra State, Nigeria. A careful examination of the results on table 1, shows that online assessment and feedback has a significant and positive effect on sustainable development (β = 0.653, t = 5.667and p = 0.004 < 0.05). Therefore, the null hypothesis three (HO3) is rejected and alternative hypothesis three (HA3) is accepted which states that online assessment and feedback has a significant and positive effect on teaching effectiveness in government owned polytechnics in Anambra State, Nigeria. The results confirm that learning management system, flipped classroom strategy and online assessment and feedback significantly fosters teaching effectiveness in government owned Polytechnics in Anambra State, Nigeria.

5. CONCLUSION AND RECOMMENDATIONS

The study revealed thatlearning management system, flipped classroom strategy and online assessment and feedback significantly and positively enhance the teaching effectiveness in government owned Polytechnics in Anambra State, Nigeria. The study recommended that tertiary institutions in Nigeria strengthen LMS utilisation through regular updates of digital learning materials and continuous monitoring of lecturers' and students' engagement.It recommended that lecturers should improve pre-class preparation and use classroom sessions for practical exercises, problem-solving, and interactive discussions.It also recommended tertiary institutions should promote timely, constructive feedback, transparent grading, and regular evaluation of online assessment practices to improve teaching effectiveness. Conclusively, the management of government-owned polytechnics in Anambra State should

adopt a coordinated approach to blended teaching by integrating Learning Management Systems, flipped classroom strategies, and online assessment and feedback into institutional teaching practices. This should be supported by adequate ICT infrastructure, continuous staff training, and systematic monitoring of teaching effectiveness.

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