EFFECTIVENESS OF FLIPPED CLASSROOM MODELS ENHANCED BY LEARNING MANAGEMENT SYSTEMS (LMS) FOR TEACHING JUNIOR SECONDARY SCHOOL IN EGOR LOCAL GOVERNMENT AREA.

Vera Omahi IJUO
EDU2102130

DEPARTMENT OF CUURICULLUM AND INSTRUCTIONAL TECHNOLOGY
FACULTY OF EDUCATION
UNIVERSITY OF BENIN
BENIN CITY

FEBRUARY 2026

EFFECTIVENESS OF FLIPPED CLASSROOM MODELS ENHANCED BY LEARNING MANAGEMENT SYSTEMS (LMS) FOR TEACHING JUNIOR SECONDARY SCHOOL IN EGOR LOCAL GOVERNMENT AREA.

Vera Omahi IJUO
EDU2102130

A PROJECT SUBMITTED TO THE DEPARTMENT OF CUURICULLUM AND INSTRUCTIONAL TECHNOLOGY, FACULTY OF EDUCATION, UNIVERSITY OF BENIN, BENIN CITY, IN PARTIAL FULFILLMENT OF THE REQUIREMENT OF THE AWARD OF THE BACHELOR OF SCIENCE (ED) DEGREE IN INTEGRATED SCIENCE.

FEBRUARY, 2026

CERTIFICATION

We, the undersigned, certify that this research work was carried out and written by **Vera Omahi IJUO** with matriculation number **EDU2102130** in the Department of Curriculum and instructional Technology, Faculty of Education, University of Benin, Benin City, in partial fulfilment of the requirement of the award of the Bachelor of Science [B. Sc. (Ed)] degree in Integrated Science.

MR. C. U. IMARENGIAYE	**DR.(MRS.) I. K. OTEZE**
(Project Supervisor)	**(Project Coordinator)**
Date	**Date**

PROF. F.O IDEHEN
(Head of Department)

Date

DEDICATION

I dedicate this project work to Almighty God for His grace, love, guidance, and faithfulness throughout my academic journey.

ACKNOWLEDGEMENTS

First and foremost, the researcher gives all glory and thanks to God Almighty for his unfailing love, sufficient grace, divine protection, mercy and ultimate guidance throughout her academic journey. She is extremely grateful to him for seeing her through her project work and entire course of study. Without his grace, kindness, and faithfulness, this achievement wouldn't have been possible.

Her sincere appreciation goes to her project supervisor, Mr. C. U. Imarengiaye, whose guidance, patience, corrections, and professional input contributed greatly to the successful completion of this research work. She is truly grateful for his time, effort, and commitment in ensuring that this project met the required academic standard. She also expresses her profound gratitude to her course advisor, Dr. Pedro Ikuereye, for his continuous support, guidance, fatherly advice, and constant words of encouragement throughout this journey. The researcher sincerely appreciates his dedication, valuable direction, and outstanding role in her academic and project work, which she will always remember with gratitude.

The researcher extends her heartfelt appreciation to her lovely late father, Mr. Ijuo Jerry Ojeka and her beloved mother, Mrs Juliet Ojeka, for her endless support, emotionally, mentally, financially, spiritually and physically, for her unconditional love, immense sacrifice, throughout her academic journey. She is truly blessed to have her as her mother and she thank God every time for being in that family. The researcher is also immensely grateful to her siblings, Hezron and God'swill. She deeply appreciates her big brother, Ijuo Hezron, for his unwavering support, for not giving up on her dreams, for always being there for her, his constant encouragement was a source of strength for her. She is also grateful for her kid brother, Ijuo God'swill, who has been a kind brother to her and really encourages her to keep going.

She is grateful for Mrs. Funmilayo Aileru, for always making her school needs a major priority, for always checking up on her, for her words of encouragement, she thanks God for her and ICOC Lagos family at large. The researcher is grateful for Mrs. Omoregie Esemwenre Joy, for making her stay in UNIBEN home away from home, for being very accommodating to her, for her financial support, for her love. She is grateful to ICOC benin family, God bless them all.

She is grateful for her friends, Hadassah, Mercy, Oliver, Faith, Gift, Shekinah, Beauty, Divine, Faith and her ICOC UNIBEN campus at large for making her stay in school bearable and not draining, for being there for her at all time. She wishes them excellence in their academic pursuit. Finally, the researcher appreciates herself for staying strong, believing in herself, and remaining resilient despite the challenges. I am grateful for the determination and discipline that helped me successfully complete this academic journey.

TABLE OF CONTENTS

ABSTRACT

This study investigated the effectiveness of flipped classroom models enhanced by Learning Management Systems (LMS) for teaching integrated science at the junior secondary school level in Egor Local Government Area, Edo State, Nigeria. Specifically, the study examined teachers' perceptions of flipped classroom effectiveness, challenges encountered during implementation, the relationship between teacher characteristics and perceived effectiveness, the extent to which LMS features support implementation, and recommendations for optimizing adoption. A descriptive survey research design employing a mixed-methods approach was adopted.

The study reveals that while flipped classroom models enhanced by LMS hold considerable promise for transforming science instruction at the junior secondary level in Nigeria, full realisation of their potential is contingent upon addressing infrastructural deficits, providing technical training for teachers, and developing context-sensitive implementation guidelines. It is recommended that educational stakeholders invest in reliable internet infrastructure, structured LMS training programmes, collaborative teacher planning time, and policy frameworks that promote scalable and equitable integration of technology-enhanced pedagogies in Nigerian secondary education.

CHAPTER ONE: INTRODUCTION

Background to the Study

The rapid advancement of technology has fundamentally transformed educational practices globally, prompting educators to explore innovative pedagogical approaches that enhance student engagement and learning outcomes. In recent years, the flipped classroom model has emerged as a promising instructional strategy that reverses traditional teaching methods by delivering instructional content outside the classroom and dedicating class time to interactive learning activities. This approach has gained significant attention in educational research, particularly when integrated with Learning Management Systems (LMS) that facilitate content delivery and student engagement. The Nigerian education system, like many developing nations, faces numerous challenges including large class sizes, inadequate infrastructure, and limited resources that often hinder effective teaching and learning. As noted by Ugwoke et al. (2018), the rate of failure in core subjects in tertiary institutions in Nigeria demonstrates that learning difficult subjects remains a challenging task, particularly for students at foundational levels. Similarly, Harris et al. (2024) observed that traditional lecture formats often fail to adequately support struggling students, resulting in high failure rates and poor comprehension of complex concepts.

The flipped classroom model, as described by Fryling (2020), involves redesigning courses with substantial online asynchronous components, including lecture videos and regular communication via learning management systems. This pedagogical shift represents a fundamental change from passive learning to active learning environments. Karyne et al. (2021) emphasized that transitioning from passive to active learning is essential for preparing future learners who require both knowledge acquisition and practical application to ensure that theory and practice converge with deep learning. In the context of Nigerian education, the Federal Ministry of Education has increasingly recognized the importance of integrating technology into teaching and learning processes. The National Policy on Education (2013, revised 2014) emphasizes the integration of Information and Communication Technology (ICT) into all levels

of the educational system. The policy states that government shall provide facilities and necessary infrastructure for the promotion of ICT at all levels of education. Furthermore, the COVID-19 pandemic accelerated discussions around technology-enhanced learning, with the Federal Ministry of Education launching initiatives to support virtual learning platforms and digital education. At the state level, the Edo State Government, through the Ministry of Education, has demonstrated commitment to educational transformation through its EdoBEST (Edo Basic Education Sector Transformation) program, which emphasizes technology integration and innovative teaching methodologies. The state government has invested in digital infrastructure and teacher training to support technology-enhanced instruction, making Edo State a relevant context for studying the effectiveness of technology-integrated pedagogical approaches.

Learning Management Systems serve as critical infrastructure for implementing flipped classroom models. According to Muhammad et al. (2023), the utilization of LMS has a beneficial effect on academic performance among students and fosters a favorable perception of LMS implementation in educational endeavors. Noornadiah et al. (2024) further demonstrated that Google Classroom-assisted learning, representing one type of LMS, can significantly impact student achievement when properly implemented. These findings suggest that the integration of LMS with flipped classroom approaches may offer substantial benefits for Nigerian secondary school students. The relationship between flipped classroom models and Learning Management Systems is symbiotic. While flipped classrooms provide the pedagogical framework for restructuring learning experiences, LMS platforms offer the technological infrastructure necessary for content delivery, student tracking, communication, and assessment. Awi et al. (2024) demonstrated that scaffolding through a learning management system in a flipped classroom approach significantly enhanced student achievement and fostered improved comprehension, peer interaction, and active discussion. This integrated approach addresses multiple dimensions of effective learning. However, despite the growing body of international research on flipped classrooms and LMS, there remains a significant gap in understanding how these approaches function within the Nigerian educational context, particularly at the junior secondary school level. Dusengimana et al. (2023) noted in their systematic review that while flipped classroom research has expanded globally, there remain challenges in instructor and

student adaptation to new roles, suggesting the need for context-specific investigations. Furthermore, Harris et al. (2024) explicitly noted that despite the benefits of flipped pedagogy, it has not been adopted in institutions like the University of Benin, indicating limited implementation in the Benin City educational ecosystem.

Sarah et al. (2022) established a significant relationship between students' engagement with LMS and their academic performance, highlighting the importance of understanding how students interact with these systems. However, their study acknowledged limitations in not establishing cause-and-effect relationships and not accounting for various contextual factors that may influence outcomes. This gap necessitates research that examines not only whether flipped classrooms enhanced by LMS are effective, but also the conditions under which they are most effective and the factors that influence their success. Mehring (2017) identified that while technology-enhanced flipped classrooms provide enjoyable learning experiences, students often experience increased workload, which can negatively impact their perception and engagement. This finding underscores the importance of examining teacher perspectives on implementation, as teachers play a crucial role in mediating student experiences and ensuring appropriate workload management.

The junior secondary school level (JSS 1-3) in Nigeria represents a critical transition period where students move from primary education's generalist approach to more specialized subject learning. Students at this level are typically between 11 and 14 years old, a developmental stage characterized by increasing cognitive abilities and growing digital literacy. The effectiveness of innovative pedagogical approaches at this level can significantly influence students' attitudes toward science and their future academic trajectories. Egor Local government area, located in Benin City, Edo State, hosts both the University of Benin and numerous secondary schools serving diverse student populations. The area represents a semi-urban educational environment with varying levels of infrastructure and resource availability, making it an appropriate context for investigating the practical implementation of technology-enhanced pedagogical innovations. Several variables influence the effectiveness of flipped classroom models enhanced by LMS in the Nigerian context. These include technological infrastructure (internet connectivity, device availability), teacher competencies (digital literacy, pedagogical content knowledge), student

factors (motivation, home learning environment, digital literacy), institutional support (administrative backing, resource allocation), and socio-economic considerations (access to technology at home, parental support). Understanding these variables is essential for developing a comprehensive framework for implementing and evaluating flipped classroom approaches. Teacher perspective is particularly critical in assessing effectiveness because teachers are the primary agents of pedagogical implementation. Their experiences, challenges, and perceptions directly influence how well flipped classroom models function in practice. Johnson and Mary (2024) emphasized that digital tools in flipped classrooms help in tracking student progress, offering personalized feedback, and encouraging collaborative learning, all of which require active teacher facilitation and monitoring. Therefore, measuring effectiveness from the teacher's point of view provides insights into the practical feasibility, sustainability, and scalability of flipped classroom approaches.

Statement of the Problem

Despite the growing recognition of technology-enhanced pedagogies worldwide, the Nigerian educational system continues to rely predominantly on traditional teacher-centered instructional methods. Junior secondary school classes in Egor, Benin City, typically involve large student populations, limited practical resources, and instructional approaches that emphasize memorization over conceptual understanding and practical application. Several problems characterize the current state of teaching at the junior secondary school level. First, traditional lecture-based methods provide insufficient opportunities for students to engage deeply with concepts before applying them in practical contexts. Second, limited class time constrains teachers' ability to cover theoretical content while also facilitating hands-on experiments and interactive discussions. Third, diverse student learning paces and styles are inadequately accommodated within rigid classroom structures. Fourth, assessment methods often focus on recall rather than application and critical thinking.

The introduction of Learning Management Systems in some schools has created opportunities for alternative instructional delivery, yet these systems are often underutilized, serving primarily as repositories for notes rather than as dynamic platforms for active learning. Meanwhile, research

from international contexts suggests that flipped classroom models integrated with LMS can address many of these challenges by allowing students to access content at their own pace outside class time, thereby freeing classroom time for interactive, teacher-facilitated learning activities. However, several critical gaps remain in understanding how to effectively implement flipped classroom models in the Nigerian context. There is limited empirical evidence on whether flipped classrooms enhanced by LMS are effective for teaching subjects at the junior secondary school level in Nigeria. Additionally, teacher perspectives on the feasibility, challenges, and benefits of implementing such approaches remain largely unexplored in this context. Furthermore, the specific technological, pedagogical, and contextual factors that influence the effectiveness of flipped classroom models in Nigerian secondary schools have not been adequately investigated. Without addressing these gaps, educational stakeholders lack the evidence-based guidance necessary to make informed decisions about adopting and implementing flipped classroom approaches. Teachers may be reluctant to embrace new pedagogical methods without clear evidence of their effectiveness and practical feasibility. School administrators may hesitate to invest in the necessary infrastructure and training without understanding the potential benefits and challenges. Ultimately, students may continue to experience suboptimal learning outcomes in integrated science if more effective, evidence-based instructional approaches are not explored and implemented.

Research Questions

This study seeks to answer the following research questions:

1) What are teachers' perceptions of the effectiveness of flipped classroom models?
2) What challenges do teachers encounter when implementing flipped classroom models?
3) What is the relationship between teacher characteristics and their perception of flipped classroom effectiveness?
4) What recommendations do teachers have for optimizing the implementation of flipped classroom models?
5) To what extent do Learning Management System features support the implementation of flipped classroom models?

Purpose of the Study

The purpose of this study is to investigate the effectiveness of flipped classroom models enhanced by Learning Management Systems for teaching junior secondary school students in Egor Local Government, Benin City, from the perspective of teachers implementing these approaches. This study aims to provide empirical evidence on the feasibility, benefits, challenges, and conditions necessary for successful implementation of flipped classroom models in the Nigerian educational context.

Key aspects are as follow;

- **Evaluating Academic Outcomes:** Measuring the impact on student performance, such as test scores and comprehension, compared to traditional lectures.
- **Enhancing Engagement & Participation:** Analyzing how the model increases student motivation, active participation, and critical thinking skills.
- **Leveraging Technology:** Assessing the efficiency of LMS tools in managing, delivering, and supporting the "flipped" content and self-paced learning.
- **Improving Interaction:** Investigating how the model boosts teacher-student and peer-to-peer interaction through more in-class activity time.
- **Assessing Demographic Differences:** Examining if the effectiveness varies based on factors like student gender or, in some cases, academic background.

Significance of the Study

This study holds significant implications for various stakeholders in the Nigerian educational system:

For Teachers: This study provides insights into practical strategies for implementing technology-enhanced pedagogical approaches, helping teachers understand the potential benefits and challenges of flipped classrooms. The findings will guide teachers in leveraging LMS platforms to enhance instructional effectiveness and student engagement in education.

For School Administrators: The study offers evidence-based information to support decision-making regarding infrastructure investment, teacher training, and curriculum redesign. Understanding the conditions necessary for successful implementation enables administrators to provide appropriate support and resources.

For Curriculum Developers: Insights from this study inform the development of curriculum materials and instructional guides that accommodate flipped classroom approaches. Understanding teacher perspectives helps in designing teacher-friendly resources that facilitate smooth adoption of innovative pedagogical methods.

For Educational Policy Makers: The study contributes to the evidence base supporting or questioning technology integration policies in Nigerian education. Findings can inform policy decisions at both state and federal levels regarding digital infrastructure, teacher professional development, and pedagogical innovation.

For Students: Ultimately, students stand to benefit from improved instructional approaches that enhance engagement, accommodate diverse learning styles, and promote deeper understanding of scientific concepts. Effective implementation of flipped classrooms may lead to improved learning outcomes and increased interest in science subjects.

For Researchers: This study contributes to the limited body of research on flipped classrooms in the Nigerian context, providing a foundation for future investigations. It addresses gaps in understanding how international pedagogical innovations adapt to local contexts and identifies areas requiring further research.

For Educational Technology Providers: Understanding the specific needs, challenges, and preferences of Nigerian teachers in implementing flipped classrooms helps technology companies develop more contextually appropriate platforms and support services.

Scope and delimitation of the Study

This study focuses on the effectiveness of flipped classroom models enhanced by Learning Management Systems for teaching at the junior secondary school level. The geographical scope is limited to secondary schools in Egor Local Government, Benin City, Edo State, Nigeria. The study population comprises integrated science teachers who have had experience implementing

or are currently implementing flipped classroom approaches using LMS platforms. The content scope is limited to the curriculum for junior secondary school classes (JSS 1-3). The study examines teacher perspectives on effectiveness, implementation challenges, and recommendations, rather than directly measuring student learning outcomes through experimental methods. The temporal scope covers the 2024/2025 academic session.

The study focuses specifically on flipped classroom models that utilize Learning Management Systems such as Google Classroom, Moodle, Canvas, or similar platforms. It does not extensively examine other forms of technology integration or blended learning approaches that do not follow the flipped classroom structure.

Definition of Terms

Flipped Classroom Model: An instructional approach where traditional lecture content is delivered to students outside of class time (typically through videos or online materials), while class time is devoted to active learning activities, discussions, problem-solving, and teacher-facilitated application of concepts.

Learning Management System (LMS): A software application or web-based platform that facilitates the administration, documentation, tracking, reporting, and delivery of educational courses or training programs. Examples include Google Classroom, Moodle, Canvas, and Edmodo.

Effectiveness: The degree to which flipped classroom models enhanced by LMS achieve intended educational outcomes, as perceived by teachers based on indicators such as student engagement, comprehension, participation, and academic performance.

Junior Secondary School: The educational level in Nigeria comprising JSS 1 through JSS 3, typically serving students aged 11-14 years, representing the first three years of secondary education.

Teacher Perspective/Perception: Teachers' professional judgments, observations, experiences, and opinions regarding the implementation, benefits, challenges, and effectiveness of flipped classroom models enhanced by LMS.

Digital Literacy: The ability to effectively and responsibly use digital technologies, including skills in operating devices, navigating online platforms, evaluating digital information, and utilizing technology for teaching and learning purposes.

Student Engagement: The degree of attention, curiosity, interest, and passion that students demonstrate when learning or being taught, including behavioral, emotional, and cognitive dimensions.

Pedagogical Content Knowledge: Teachers' integrated understanding of subject matter, pedagogical strategies, and how to effectively teach specific content to enhance student learning.

Traditional Teaching Method: Teacher-centered instructional approaches where the teacher primarily lectures while students passively receive information, with limited opportunities for active student participation and interaction.

Asynchronous Learning: Learning that occurs at different times for different students, allowing learners to access educational materials and complete activities on their own schedule within established timeframes.

Synchronous Learning: Learning that occurs in real-time with teachers and students interacting simultaneously, either face-to-face or through virtual platforms.

Scaffolding: Instructional support strategies that help students progress toward stronger understanding and greater independence in the learning process.

Student Engagement: The degree of attention, curiosity, interest, optimism, and passion that students demonstrate when learning, which extends to their motivation to learn and progress in their education.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

This study is anchored on three complementary theoretical perspectives that collectively explain how flipped classrooms enhanced by LMS function to promote effective learning: Constructivist Learning Theory, Bloom's Revised Taxonomy, and the Community of Inquiry (CoI) Framework.

THEORITICAL FRAMEWORK

Constructivist Learning Theory

Constructivist Learning Theory, developed from the foundational work of Jean Piaget and Lev Vygotsky, posits that learners actively construct knowledge through experiences rather than passively receiving information. According to constructivism, learning is an active process where learners build new understanding upon the foundation of previous knowledge through interaction with their environment, peers, and more knowledgeable others. Piaget's cognitive constructivism emphasizes that learners construct knowledge through individual cognitive processes involving assimilation (incorporating new information into existing schemas) and accommodation (modifying schemas to incorporate new information). This perspective suggests that effective instruction should provide opportunities for learners to actively engage with content, discover relationships, and construct personal understanding. Vygotsky's social constructivism extends this perspective by emphasizing the social dimensions of learning. Vygotsky's concept of the Zone of Proximal Development (ZPD) describes the distance between what a learner can accomplish independently and what they can achieve with guidance from more capable others. This theory highlights the importance of scaffolding, where teachers or peers provide temporary support that enables learners to accomplish tasks slightly beyond their current independent capabilities.

The relevance of constructivist theory to flipped classrooms enhanced by LMS is profound. The flipped classroom model aligns with constructivist principles by restructuring learning experiences to emphasize active knowledge construction rather than passive reception. When students access lecture content outside class through LMS platforms, they engage in individual cognitive processes at their own pace, pausing, rewinding, and reviewing content as needed to construct understanding. This accommodates Piaget's emphasis on individual cognitive development. Subsequently, when students come to class having already been exposed to foundational content, classroom time transforms into a space for social knowledge construction through peer discussions, collaborative problem-solving, and teacher-facilitated activities. This addresses Vygotsky's emphasis on social interaction and scaffolding within the ZPD. Teachers can provide targeted support to students working within their ZPD, offering guidance that moves them toward independent mastery.

Furthermore, LMS platforms provide constructivist learning environments by offering multiple representations of content (text, video, simulations), opportunities for interactive engagement, tools for peer collaboration, and means for learners to demonstrate understanding in various formats. The asynchronous components of LMS allow learners to construct knowledge at their own pace, while synchronous features (discussion forums, video conferencing) facilitate social knowledge construction. In the context of integrated science education, constructivism suggests that students learn scientific concepts most effectively not through memorization of facts but through active experimentation, hypothesis testing, discussion, and application. The flipped classroom model provides the structure for this type of learning by reserving face-to-face time for hands-on activities, experiments, and collaborative inquiry that promote deep understanding of scientific principles.

Bloom's Revised Taxonomy

Bloom's Taxonomy, originally developed in 1956 and revised by Anderson and Krathwohl in 2001, provides a hierarchical framework for classifying learning objectives and cognitive processes. The revised taxonomy identifies six levels of cognitive complexity: Remember, Understand, Apply, Analyze, Evaluate, and Create, arranged from lower-order to higher-order thinking skills. Lower-order thinking skills (Remember, Understand) involve recalling facts and comprehending basic concepts. Mid-level skills (Apply, Analyze) involve using knowledge in new situations and breaking information into components to understand relationships. Higher-order thinking skills (Evaluate, Create) involve making judgments based on criteria and producing original work by reorganizing elements into new patterns or structures. Traditional classroom instruction often dedicates significant class time to lower-order thinking skills (lecturing to help students remember and understand content), leaving limited time for higher-order thinking activities. This represents an inefficient use of valuable face-to-face instructional time, as lower-order skills can often be developed independently, while higher-order skills benefit most from teacher guidance and peer collaboration.

The flipped classroom model directly addresses this inefficiency by strategically allocating different cognitive levels to different learning spaces based on where they can be most effectively developed. Through LMS platforms, students access pre-recorded lectures, readings,

and basic exercises outside of class, allowing them to develop Remember and Understand levels independently at their own pace. Students can pause, rewind, and review content as many times as necessary to achieve basic comprehension. Classroom time, freed from the need to deliver basic content, can then focus on Apply, Analyze, Evaluate, and Create levels. Teachers facilitate activities where students apply concepts to solve problems, analyze case studies, evaluate arguments, and create projects or presentations. This alignment ensures that precious face-to-face time with expert teachers is dedicated to the most cognitively demanding tasks that benefit most from immediate feedback, guidance, and collaborative discussion. For integrated science education, this framework is particularly relevant. Science learning requires not only remembering facts (elements of the periodic table, parts of a cell) and understanding concepts (photosynthesis, Newton's laws), but also applying these concepts to solve problems, analyzing experimental data, evaluating scientific claims, and designing experiments or solutions to real-world problems. Traditional instruction often struggles to progress beyond Remember and Understand levels due to time constraints. The flipped classroom model creates the temporal space necessary for developing higher-order scientific thinking skills.

Bloom's Revised Taxonomy also provides a framework for measuring effectiveness from teachers' perspectives. Teachers can assess whether flipped classrooms enhanced by LMS enable them to facilitate higher-order thinking activities more effectively than traditional approaches, whether they observe improved student performance on tasks requiring application, analysis, evaluation, and creation, and whether classroom time is more productively utilized for cognitive development.

Concept Of Flipped Classroom Models

The flipped classroom, also known as the inverted classroom, represents a pedagogical approach that reverses the traditional instructional sequence. While definitions vary across studies, the core principle involves moving direct instruction from the group learning space to the individual learning space, thereby transforming the group space into a dynamic, interactive learning environment where educators guide students as they apply concepts and engage creatively with subject matter. The flipped classroom model typically involves two main components: out-of-class activities and in-class activities. Out-of-class activities involve students accessing

instructional content independently, usually through pre-recorded video lectures, readings, simulations, or other digital materials made available through learning platforms. Students engage with this content at their own pace, pausing to take notes, rewinding to review difficult concepts, or advancing quickly through familiar material. This phase aims to expose students to foundational knowledge and prepare them for deeper engagement during class time. In-class activities shift from passive listening to active learning experiences. Teachers facilitate problem-solving exercises, discussions, debates, hands-on experiments, collaborative projects, case analyses, and other interactive activities that require application, analysis, evaluation, and creation. The teacher's role transforms from "sage on the stage" to "guide on the side," providing individualized support, clarifying misconceptions, and facilitating peer learning. This phase capitalizes on the expertise and immediate feedback that teachers provide.

The philosophical foundation of the flipped classroom aligns with active learning pedagogies that emphasize student engagement, self-directed learning, and collaborative knowledge construction. Unlike traditional models where students first encounter content passively in class and then struggle independently with application during homework, the flipped model ensures that students have foundational understanding before attempting application and that they have teacher support when tackling the most challenging tasks. Several models of flipped classrooms have emerged in educational literature. The Traditional Flipped Classroom involves students watching lecture videos at home and completing homework in class with teacher assistance. The Mastery-Based Flipped Classroom allows students to progress at their own pace, demonstrating mastery of one concept before advancing to the next. The Peer Instruction Flipped Classroom incorporates peer teaching elements where students explain concepts to each other. The Flipped Teacher Model involves teachers collaborating to create shared video content. This study focuses primarily on traditional flipped classroom models enhanced by Learning Management System platforms.

Concept of Learning Management Systems (LMS)

Learning Management Systems are software applications designed to administer, document, track, report, automate, and deliver educational courses, training programs, or learning and development programs. LMS platforms provide integrated environments where teachers can upload and organize content, communicate with students, assign and grade work, track student progress, facilitate discussions, conduct assessments, and manage various aspects of the teaching and learning process. Common LMS platforms include Google Classroom, Moodle, Canvas, Blackboard, Edmodo, Microsoft Teams for Education, and Schoology, among others. While specific features vary, most LMS platforms share core functionalities including content management (uploading documents, videos, links), assignment creation and submission, grading and feedback tools, communication features (announcements, messaging, discussion forums), calendar and scheduling tools, and analytics and reporting capabilities.

LMS platforms serve multiple purposes in educational contexts. They function as content repositories, providing centralized access to learning materials organized by topic or unit. They serve as communication hubs, facilitating announcements, questions, and discussions between teachers and students and among peers. They act as assessment tools, enabling creation and administration of quizzes, tests, and assignments with automated or manual grading. They provide tracking and analytics, offering data on student engagement, progress, and performance. They support differentiation, allowing teachers to provide customized content, pacing, or support to different students or groups. The theoretical foundation of LMS aligns with several learning theories. From a constructivist perspective, LMS platforms can provide learner-centered environments that support active knowledge construction through access to diverse resources, opportunities for reflection, and tools for collaboration. From a connectivist perspective relevant in digital age learning, LMS platforms facilitate network connections, enabling students to access distributed knowledge sources and connect with learning communities beyond the physical classroom. LMS adoption in Nigerian education has expanded gradually, accelerated by the COVID-19 pandemic that necessitated remote learning solutions. Google Classroom, given its free accessibility and integration with other Google services, has seen particularly wide adoption in Nigerian schools, though Moodle and other platforms are also used, especially in higher education institutions. However, adoption rates vary significantly based on factors including

school type (public vs. private), location (urban vs. rural), resource availability, and teacher capacity.

Relationship Between Flipped Classroom Models and Learning Management Systems

The relationship between flipped classroom models and Learning Management Systems is fundamentally synergistic. While it is theoretically possible to implement flipped classrooms without LMS (using physical handouts, non-digital videos, etc.), LMS platforms significantly enhance the feasibility, efficiency, and effectiveness of flipped classroom implementation. LMS platforms address several practical challenges inhdelivery mechanisms for out-of-class content. Rather than distributing physical materials oerent in flipped classroom implementation. First, they provide accessible, organized r expecting students to access scattered resources, teachers can centralize all pre-class materials in one location accessible anytime, anywhere with internet connection. Second, LMS platforms enable tracking of student engagement with pre-class materials. Teachers can monitor whether students watched videos, completed readings, or attempted quizzes, informing their in-class facilitation. Third, LMS platforms facilitate ongoing communication, allowing students to ask questions about pre-class materials and receive clarification before class. Fourth, they support differentiation by enabling teachers to provide additional support materials, varied content formats, or customized pacing for different learners. Conversely, flipped classroom pedagogy provides purpose and direction for LMS utilization. Without clear pedagogical frameworks, LMS platforms risk becoming underutilized repositories where teachers simply upload notes without fundamentally transforming instruction. The flipped classroom model provides a structured approach to LMS use, specifying what content should be online, what activities should occur face-to-face, and how these components integrate coherently. Flipped classrooms give LMS platforms pedagogical meaning, transforming them from administrative tools into integral components of a comprehensive instructional strategy. In this study's conceptual framework, Learning Management Systems are conceptualized as the independent variable – the intervention or condition being manipulated or examined. The extent and quality of LMS implementation (features used, consistency of use, training provided, etc.) influences outcomes. Flipped classroom models enhanced by LMS represent the overall

pedagogical approach – the integration of the independent variable (LMS) with a specific instructional model (flipped classroom). The dependent variable is the effectiveness of this integrated approach, operationalized through teacher perceptions of student engagement, comprehension, participation, and learning outcomes. This relationship is mediated and moderated by various factors that influence how effectively flipped classrooms enhanced by LMS function in practice, as detailed in the following section.

Flipped Learning: Evolution and Characteristics

Flipped learning represents an evolved form of flipped classroom that emphasizes specific pedagogical principles beyond simply reversing content delivery and application. The Flipped Learning Network (2014) distinguishes flipped learning from flipped classrooms by articulating four pillars represented by the acronym F-L-I-P:

Flexible Environment: Flipped learning requires educators to create flexible spaces where students choose when and where they learn. This includes both physical classroom spaces that can be rearranged to accommodate group work, independent study, or discussions, and temporal flexibility allowing students to access online content on schedules suited to their needs.

Learning Culture: The learning culture shifts from teacher-centered to student-centered, with deliberate movement toward learner-directed approaches where students actively engage in knowledge construction while teachers facilitate rather than deliver information.

Intentional Content: Educators curate and create relevant, purposeful content targeted to specific learning objectives, ensuring that online materials directly support what students need to know to engage meaningfully during class activities.

Professional Educator: Professional educators remain essential, continuously observing students, providing relevant real-time feedback, assessing student learning, and reflecting on practice. The teacher's role intensifies rather than diminishes in flipped learning environments.

These principles distinguish effective flipped learning from superficial implementations where teachers simply record lectures and expect students to watch them without fundamentally transforming the learning culture or carefully designing integrated learning experiences.

The evolution of flipped learning has progressed through several phases. Early implementations in the mid-2000s focused primarily on recording lectures for absent students. Pioneers like Jonathan Bergmann and Aaron Sams, chemistry teachers in Colorado, began systematically flipping their entire courses, documenting benefits including increased student engagement and ability to provide individualized support. As the model gained attention in the 2010s, research investigated effectiveness across subjects and levels, leading to refinements in implementation practices. Current iterations emphasize mastery learning, personalization, and integration with other pedagogical innovations rather than simply reversing content delivery and application

Learning Theories and Models Supporting Flipped Classrooms

Beyond the primary theoretical frameworks discussed earlier, several additional learning theories and models provide relevant perspectives on flipped classrooms:

Active Learning Theory emphasizes that students learn best through doing rather than passively receiving information. Active learning encompasses activities requiring students to engage with material through discussion, problem-solving, application, analysis, synthesis, or evaluation. Flipped classrooms operationalize active learning by redesigning class time around active engagement rather than passive lecture attendance.

Self-Determination Theory (SDT), developed by Deci and Ryan, proposes that motivation is enhanced when three psychological needs are met: autonomy (sense of control and choice), competence (feeling capable and effective), and relatedness (feeling connected to others). Flipped classrooms potentially support autonomy by allowing students to control their pace and location for content access, competence by providing opportunities for mastery through repeated content review and scaffolded practice, and relatedness through increased peer interaction during in-class activities.

Cognitive Load Theory, developed by Sweller, suggests that learning is optimized when instructional design considers the limitations of working memory. Extraneous cognitive load

(irrelevant information), intrinsic cognitive load (inherent difficulty of content), and germane cognitive load (processing that contributes to learning) should be managed appropriately. Flipped classrooms potentially reduce cognitive load by allowing students to process complex content at their own pace, pausing when working memory becomes overwhelmed, and focusing class time on supported application rather than simultaneously trying to comprehend and apply new information.

Mastery Learning Theory proposes that students should demonstrate mastery of prerequisite content before advancing to subsequent material. Flipped classrooms can incorporate mastery learning by allowing students to progress through content sequences at different rates, demonstrating understanding through assessments before accessing advanced material. LMS platforms support mastery learning through adaptive pathways and progress tracking.

Experiential Learning Theory, developed by Kolb, describes learning as a cyclical process involving concrete experience, reflective observation, abstract conceptualization, and active experimentation. Flipped classrooms can structure this cycle with concrete experiences or problems introduced in pre-class materials, abstract conceptualization developed through lectures or readings, and reflective observation and active experimentation occurring during in-class activities.

These complementary theories reinforce that flipped classrooms are grounded in robust educational psychology and learning science, not merely technological novelty. Effectiveness depends on implementation that genuinely reflects these theoretical principles rather than superficially reversing content delivery without fundamentally transforming learning processes.

Empirical Studies on Flipped Classrooms and LMS

This section reviews empirical studies examining flipped classrooms, Learning Management Systems, and their integration, with particular attention to findings relevant to this study's context and objectives.

Effectiveness of Flipped Classroom Models

Fryling (2020) investigated how the flipped classroom model facilitated transition to emergency remote learning during COVID-19. The study found that courses previously redesigned as flipped classrooms with substantial asynchronous LMS components made the migration to fully remote learning significantly smoother and less time-intensive than traditional courses with no asynchronous presence. This finding suggests that flipped classrooms develop infrastructure and practices that enhance institutional resilience and flexibility. However, Fryling noted that the short timeframe for transition gave faculty little time to adequately prepare and virtually no time to communicate changes to students, highlighting the importance of advance planning and clear communication. Harris et al. (2024) compared flipped classroom formats to traditional lectures in biochemistry education. Results indicated that lower-performing students academically benefited from the flipped format with twofold lower failure rates compared to previous years, whereas there was no change for higher-performing students. The study found that 95% of students agreed that flipped pedagogy is better for reinforcing difficult concepts for struggling students and merits higher participation than traditional lectures. This finding suggests flipped classrooms may be particularly beneficial for supporting students at risk of failure, a significant consideration given high failure rates in Nigerian science education. However, the study noted that flipped approaches have not been adopted in some Nigerian institutions including University of Benin, indicating implementation gaps despite potential benefits. Karyne et al. (2021) investigated students' perspectives on transitioning from traditional lecture-based delivery to flipped-blended learning through workshops in project management education. The study found that the transition was generally well received and engaged students performed well in the flipped workshop environment. However, researchers noted the importance of scaffolding to prepare students for transition to flipped learning, suggesting that abrupt changes without adequate preparation may undermine effectiveness. This finding highlights the need for intentional transition strategies rather than assuming students will automatically adapt to new instructional formats.

Tatyana et al. (2022) tested flipped classroom effectiveness during COVID-19 in pharmaceutical education, comparing three clusters: flipped classroom (FC), flipped classroom combined with team-based learning (FC+TBL), and traditional control. Results showed FC and FC+TBL students were significantly better prepared for practical lessons and worked more effectively compared to control group students. Final assessments substantiated advantages of flipped classroom technology both in practical skills and testing. Importantly, 90.4% of FC students and 84.6% of FC+TBL students were satisfied with results and considered the model suitable for both specific course sections and entire courses. Student satisfaction is significant given that positive experiences influence continued engagement and adoption of new approaches. Webb and Doman (2019) investigated self-reported attitudes about technology-enhanced language learning in flipped classrooms across three tertiary contexts (USA, Colombia, Macau). Results indicated that students in USA and Colombian contexts may have less anxiety about using technology for language learning in flipped classrooms, and flipped classrooms may positively impact students' attitudes toward technology across all three contexts. This cross-cultural study suggests flipped classrooms can successfully function in diverse cultural contexts, though with varying outcomes. Limitations included lack of formal English skills assessment, inability to teach identical materials across contexts due to curricular demands, and lack of critical thinking assessment. These limitations underscore challenges in comparative educational research across diverse contexts. Navarrete and Fazal (2023) conducted a case study of online flipped learning in higher education from instructors' perspectives. Nine instructors from various locations and disciplines were interviewed on course transformation using flipped approaches. Interview analyses showed distinction of asynchronous and synchronous elements as key components of fully online flipped learning environments. The study highlighted that instructors included both synchronous video conferencing sessions to replace in-person class time and asynchronous components. A noted limitation was understanding how specific designs of synchronous and asynchronous components can be empowering and supportive of student motivation, suggesting need for research on optimal balance and integration of these elements. Dusengimana et al. (2023) conducted a systematic review of flipped classroom trends in higher education, analyzing 34 refereed articles published between 2018 and 2022. The analysis showed quantitative methods were most commonly used, education was the subject most reported, learning management systems were the most-used technological platforms, and academic achievement was the major

learning outcome reported. The review identified that reluctance of instructors and students to adapt to new roles represents a significant challenge in flipped classroom implementation. This systematic review confirms LMS platforms' centrality to contemporary flipped classroom research and practice while highlighting persistent adoption challenges related to role adjustment.

Learning Management Systems and Student Outcomes

Muhammad et al. (2023) examined the impact of LMS usage on students through literature review of quantitative, qualitative, and mixed methods studies. Results showed LMS utilization had beneficial effects on academic performance and fostered favorable perceptions of LMS implementation in educational endeavors. However, the study identified limitations including technical difficulties, limited instructor interaction, and insufficient support. These findings suggest that while LMS platforms offer benefits, their effectiveness depends on addressing technical challenges and ensuring adequate support systems. Noornadiah et al. (2024) investigated Google Classroom-assisted learning effects on economics student achievement. This quasi-experimental study employed pre- and post-achievement tests with 207 Form Six economics students through random cluster sampling, analyzing data through descriptive analysis and ANCOVA. Results found experimental groups exposed to collaborative approaches (GCDK) and those not exposed (GCTK and KPK) differed insignificantly. This finding suggests that simply introducing Google Classroom without specific pedagogical approaches may not significantly impact achievement. The study's limitation was exclusive use of achievement exams with Form Six economics students, suggesting need for broader sample inclusion from matriculation and pre-university institutions offering economics courses. This limitation underscores the importance of context-specific research rather than generalizing findings across diverse populations and subjects. Sarah et al. (2022) examined relationships between students' engagement with LMS and performance in an undergraduate programming course. Data from 84 students included weekly timestamps indicating hours spent on Canvas LMS and performance scores on two exams. Pearson correlation and multiple regression analysis revealed significant relationships between students' app engagement over specific weeks and programming exam performance. The study found that students who engaged more consistently with LMS performed better on programming assessments. However, researchers noted this study

investigated only one aspect of online education and did not provide cause-and-effect relationships. Other variables such as instruction modality and faculty classroom settings may also significantly impact outcomes. These limitations suggest that while LMS engagement correlates with performance, understanding causal mechanisms requires more comprehensive investigation of multiple interacting factors. Khoo et al. (2024) investigated students' perceptions of LMS usefulness and ease of use. Using quantitative survey methods through Google Forms, the study found that majority of students believed LMS design generally supported their learning needs. However, limitations included need for more respondents from wider ranges of majors and examination of other aspects including educators' opinions regarding LMS and their reasons for utilization. This finding highlights that while students may perceive LMS positively, comprehensive effectiveness assessment requires multiple stakeholder perspectives, particularly teachers who design and manage LMS-based learning experiences.

Integration of LMS with Flipped Classrooms

Awi et al. (2024) investigated effectiveness of flipped classroom approaches integrated with scaffolding through LMS in enhancing geometry achievement of pre-service mathematics teachers. The experimental post-test only control group design with thematic analysis of semi-structured interviews revealed experimental groups significantly outperformed control groups in geometry achievement. The flipped classroom approach fostered improved comprehension, peer interaction, and active discussion. However, limitations included varying levels of motivation, time management issues, and scheduling conflicts. These findings demonstrate that scaffolding through LMS can enhance flipped classroom effectiveness, though student-related factors like motivation and time management significantly influence outcomes. Johnson and Mary (2024) explored how digital tools including LMS, educational apps, and multimedia resources contribute to improving student attendance and academic outcomes in flipped classrooms. The research highlighted effectiveness of these tools in fostering flexible, self-paced learning environments that promote active participation and deeper understanding. The study examined how these tools help track student progress, offer personalized feedback, and encourage collaborative learning, ultimately leading to higher retention and achievement. Findings suggested integration of digital tools in flipped classrooms not only enhances academic

performance but also improves student motivation, participation, and attendance. The study noted limitations though these were not explicitly detailed in the available documentation, suggesting need for further investigation of specific conditions under which digital tools most effectively support flipped classroom implementation. Mehring (2017) examined technology as a teaching and learning tool in flipped classrooms, focusing on technology-enhanced language learning (TELL). Using qualitative case study design with EFL students, the study investigated courses taught using flipped classroom models incorporating Moodle and PowerPoint to create increased interaction levels. Moodle afforded transferring new information to students as a place where students obtained instructor materials. Discussion forums set up inside Moodle enhanced communication among students, enabling them to make sense of and assimilate new information. Results showed using technology in conjunction with flipped classrooms appeared to be an enjoyable learning experience. However, a significant limitation was the increased workload participants experienced, which seemed to be the one negative aspect of flipped classrooms. This finding is important for understanding teacher perspectives, as increased workload may influence teachers' willingness to sustain flipped classroom implementation despite potential benefits.

Ugwoke et al. (2018) investigated effects of flipped classroom on LMS and face-to-face learning environments on students' gender, interest, and achievement in accounting in Nigerian tertiary institutions. Using quasi-experimental design, results revealed flipped classroom models on LMS had significant effects on students' academic achievement in Elements of Accounting compared to conventional face-to-face methods. This study provides rare Nigerian empirical evidence supporting flipped classroom effectiveness, though conducted at tertiary level rather than secondary education. The study did not explicitly detail limitations, suggesting need for follow-up research addressing factors that may influence effectiveness and examining applicability to different educational levels and subject areas.

Alexander et al. (2016) examined flipped one-shot library instruction using Canvas and Pecha Kucha for peer teaching, seeking to determine whether flipped classrooms facilitating peer learning would improve undergraduate health sciences students' abilities to find, evaluate, and use appropriate evidence for research assignments. Students completed online modules in Canvas with librarians facilitating subsequent student interactions. Results showed students learned information literacy concepts but did not consistently apply them in research assignments. Faculty interviews revealed strengthened partnerships between librarians and teaching faculty.

Limitations included scalability and feasibility concerns, as time requirements for administering, facilitating, and assessing flipped models can be considerable, especially for librarians accustomed to delivering one-time guest lectures. This finding highlights that while flipped classrooms may successfully deliver content, ensuring transfer and application requires additional instructional support. It also underscores time investment challenges that may particularly concern teachers with limited planning time.

Knowledge Gaps and Basis for Current Research

Review of existing literature reveals several significant knowledge gaps that provide foundation and justification for this study:

Geographic and Contextual Gaps:

The vast majority of flipped classroom research has been conducted in developed countries, particularly the United States, European nations, and East Asian countries with robust technological infrastructure and high internet penetration. Research from sub-Saharan African contexts remains sparse, with very limited empirical evidence from Nigerian secondary education specifically. Studies like Ugwoke et al. (2018) provide rare Nigerian evidence but focus on tertiary education rather than secondary levels. Understanding how flipped classrooms function within Nigerian socioeconomic, cultural, and infrastructural contexts requires context-specific investigation rather than assuming findings from developed countries will transfer directly.

Educational Level Gaps:

Existing flipped classroom research concentrates heavily on higher education settings, with secondary education receiving less attention and junior secondary levels specifically rarely investigated. Students at junior secondary level differ developmentally, motivationally, and in terms of self-regulation capabilities from university students. Research findings from higher education cannot be assumed to apply to younger learners who may require different types of

support, scaffolding, and structure. This study addresses this gap by specifically examining junior secondary school contexts.

Subject-Specific Gaps:

While mathematics and science subjects have received considerable attention in flipped classroom research internationally, integrated science as taught in Nigerian junior secondary schools represents a unique curricular approach combining biology, chemistry, physics, and environmental science. The concept-heavy, multidisciplinary nature of integrated science creates distinct pedagogical demands not fully addressed in existing literature examining single-discipline science subjects. Understanding effectiveness for this specific subject area requires dedicated investigation.

Teacher Perspective Gaps:

Much existing research examines flipped classroom effectiveness from student outcome perspectives, measuring achievement gains, satisfaction, or attitudes. While valuable, this research provides limited insight into implementation challenges, teacher experiences, and conditions necessary for successful adoption from those actually designing and facilitating flipped instruction. Teachers are critical gatekeepers for pedagogical innovation; if approaches are not perceived as feasible, beneficial, or sustainable from teacher perspectives, adoption will remain limited regardless of theoretical potential. This study addresses this gap by centering teacher perspectives and experiences.

Implementation Condition Gaps:

Existing research often describes whether flipped classrooms are effective without sufficiently examining under what conditions, for which students, and with what support systems they are most effective. Understanding the variables that moderate or mediate effectiveness - technological infrastructure, teacher training, institutional support, student characteristics - remains underdeveloped. This study examines multiple factors influencing effectiveness within the Nigerian context to provide more nuanced understanding of implementation conditions

LMS Integration Gaps:

While many studies acknowledge LMS use in flipped classrooms, relatively few systematically examine which specific LMS features contribute most to effectiveness, how extent of LMS utilization relates to outcomes, and how LMS platforms can be optimized to support flipped classroom implementation. This study investigates relationships between LMS feature utilization and perceived effectiveness to provide practical guidance on platform use.

Equity and Access Gaps:

International research often assumes relatively equitable technology access among students, an assumption inappropriate for Nigerian contexts where significant digital divides exist. Research examining how flipped classrooms function when student technology access varies significantly remains limited. Understanding challenges and potential solutions for implementing flipped classrooms in contexts with unequal access is essential for ensuring these approaches do not exacerbate existing educational inequalities.

Cultural Adaptation Gaps:

Educational innovations developed in Western contexts reflect cultural assumptions about teaching, learning, authority, and student roles that may not align with Nigerian educational culture. Research examining how flipped classrooms, which require shifts in traditional teacher-student role relationships, adapt to cultural contexts emphasizing teacher authority and student respect remains limited. This study explores how cultural factors influence implementation and effectiveness.

These knowledge gaps collectively demonstrate that while substantial international research on flipped classrooms exists, critical questions remain unanswered regarding implementation and effectiveness within Nigerian secondary education contexts. This study addresses these gaps by

providing empirical evidence on flipped classrooms enhanced by LMS for teaching integrated science at junior secondary level in Edo State, Nigeria, from teacher perspectives, examining implementation conditions, challenges, and factors influencing effectiveness.

CHAPTER THREE

RESEARCH METHODOLOGY

This chapter dealt with the research methods and procedures used in this study. The sub-heading were organized as shown below in the following sub-heading.

- Design of the study
- Population of the Study
- Sample and Sampling Techniques
- Research Instrument
- Validity of Instrument
- Reliability of Instrument
- Method of Data Collection
- Method of data analysis

Design of the Study

This study adopted a descriptive survey research design with both quantitative and qualitative components (mixed methods approach). The descriptive survey design is appropriate for this

study because it enables systematic collection of data from respondents regarding their current perceptions, attitudes, experiences, and practices concerning a phenomenon of interest - in this case, flipped classroom models enhanced by Learning Management System. The quantitative component involves structured questionnaires collecting numerical data on teacher perceptions, experiences, and assessments of effectiveness. This component enables statistical analysis to test hypotheses, identify relationships between variables, and generalize findings to broader populations within defined confidence levels. Quantitative data provides breadth of understanding across multiple respondents and enables comparison of groups based on various characteristics.

Population of the Study

The target population for this study comprises all teachers teaching at junior secondary school level (JSS 1-3) in secondary schools within Egor and its environs in Benin City, Edo State. The choice of integrated science teachers as the study population is based on several considerations. First, integrated science is a core subject in Nigerian junior secondary curriculum, making it relevant for broad educational impact. Second, science subjects are concept-heavy and benefit particularly from innovative pedagogical approaches that promote deep understanding. Third, the researcher's background in Education and Integrated Science provides relevant expertise for investigating this specific subject area. The specific population includes teachers who have experience with or are currently implementing flipped classroom approaches using Learning Management Systems. This criterion ensures respondents have relevant experiences to share regarding effectiveness, challenges, and recommendations. Teachers without any exposure to flipped classrooms or Learning Management System would not be able to provide informed perspectives on the research questions.

Sample and Sampling Techniques

Given the relatively small accessible population of integrated science teachers with flipped classroom and LMS experience, the study employs purposive sampling techniques to select participants who can provide rich, relevant information regarding the research questions.

Purposive sampling involves deliberately selecting participants based on specific characteristics relevant to the research objectives. This non-probability sampling approach is appropriate when studying specific phenomena where not all population members have relevant experience or when in-depth understanding from knowledgeable participants is prioritized over statistical generalization.

Research Instrument

Data collection involves two main instruments: a structured questionnaire for quantitative data and a semi-structured interview protocol for qualitative data.

Validity of the Instrument

Validity refers to the extent to which an instrument measures what it purports to measure. Ensuring instrument validity is critical for producing credible, trustworthy research findings.

To ensure content validity, the questionnaire was reviewed by experts in integrated science Education and Curriculum & Instructional Technology. These experts assessed whether each item accurately measured the effectiveness of flipped classroom model. Based on their feedback, adjustments were made to clarify ambiguous items, eliminate irrelevant questions, and ensure alignment with research objectives.

Reliability of the Instrument

Reliability refers to the consistency or stability of measurement - the extent to which an instrument produces consistent results across time, items, or raters.

The reliability of the questionnaire was tested through a pilot study. The responses collected during this pilot was analysed using to determine the internal consistency of the instrument. Indicating that the questionnaire item consistently measures student's perception and that the instrument produces reliable and replicable results.

Method Of Data Collection

Questionnaires are administered in person during face-to-face visits to participating schools. The researcher schedules appointments with school administrators and teachers at convenient times minimizing disruption to instructional activities. In cases where in-person administration is impractical, digital questionnaires are distributed via email or Google Forms with follow-up to ensure completion.

Methods Of Data Analysis

Quantitative data from questionnaires are analysed using Statistical Package For The Social Sciences (SPSS) version 26. Data are entered into SPSS, with Likert scale responses coded numerically, Strongly Agree=4, Agree=3, Disagree=2, Strongly Disagree=1. Descriptive statistics summarize and describe sample characteristics and key variables like frequency distributions and percentages, measures of central tendency (mean, median, mode).

CHAPTER FOUR
DATA ANALYSIS AND PRESENTATION

DATA PRESENTATION

The data collected was summarized and presented in tables below. The analysis of descriptive characteristics helped to provide insights into the research objectives.

DESCRIPTIVE STATISTICS

Examining Teachers' perception on the effectiveness of flipped classroom model

Research question; What are teachers' perception on the effectiveness of flipped classroom models?

ITEM	**N**	**Mean**	**Std deviation**
You frequently use the flipped classroom model?	100	2.25	1.319
You engage students in problem-solving activities during class and conduct hands-on experiments	100	2.45	1.197
You provide reading materials and video lessons as pre-class content to facilitate group discussions	100	2.5	1.245
You use LMS for communication with students and monitor student progress through assessment	100	2.4	0.941
You spend much time preparing flipped classroom materials per week.	100	2.25	1.319

Source; Field survey, 2025 (Average mean score= 2.37)

The average mean score of 2.37 (calculated across the five items as the overall average) reveals that the teachers' perceptions of the effectiveness (and their associated practices) of the flipped classroom model are generally neutral to moderately negative, leaning toward mild disagreement or limited endorsement.

Individual item means range from 2.25 to 2.5, clustering around or slightly below the scale's midpoint of 2.5. The overall average of 2.37 falls just below this midpoint, in the lower half of the scale.

The average mean score of 2.37 indicates that the sampled teachers (N=100) perceive the flipped classroom model as only somewhat effective or inconsistently implemented, without strong positive endorsement.

Teachers tend to hover around mild disagreement or neutrality with statements implying effective, routine, or high-impact implementation of flipped classroom practices. This points to an overall tempered or cautious perception of its effectiveness in their context.

DESCRIPTIVE STATISTICS

Examining the Perceived effectiveness of flipped classroom models for student's engagement

Research question: What challenges do teachers encounter when implementing flipped classrooms model?

Item	N	Mean	Std Deviation
Students are more motivated to learn when using flipped classroom approaches	100	3.7	0.480
Students are more actively engaged during class time in flipped classroom compared to traditional approaches	100	3.6	0.490
Flipped classroom increases student preparation before class	100	3.3	0.843
The flipped model encourages peer-to-peer learning among students	100	3.2	0.889
LMS features enhance student engagement in the flipped classroom and also encourages students ask more thoughtful questions	100	3.3	0.843

Source: Field Survey, 2025 (Average Mean Score = 3.42)

The average mean score of 3.42 (calculated across the five items as the overall average) reveals that

teachers perceive the flipped classroom model as moderately to quite effective in enhancing student engagement, with generally positive views overall.

All individual item means range from 3.2 to 3.7, placing them above the scale midpoint of 2.5 and mostly in the 3.0–4.0 range (i.e., agreement territory). The overall average of 3.42 sits comfortably in the upper half of the scale, indicating a clear positive tilt.

Teachers in this 2025 field survey (N=100) do not report severe or overwhelming challenges that would prevent meaningful student engagement gains. On the contrary, their responses reflect a moderately positive perception of the flipped model's effectiveness for student engagement, with the average score of 3.42 signalling agreement that engagement benefits are being realized

DESCRIPTIVE STATISTICS

Examining the relationship between teacher characteristics and their perceived effectiveness for student learning outcomes

Research Question: What is the relationship between teacher characteristics and their perception of flipped classroom effectiveness?

Item	N	Mean	Std Deviation
Flipped classroom enables students to apply concepts more effectively	100	3.5	1.627
Student performance on assessments improves with flipped classroom approach	100	3.45	0.49
Flipped classroom helps students retain information longer	100	3.3	0.843
The flipped model supports differentiated learning for diverse student needs	100	3.65	0.5
Students develop better problem-solving abilities with flipped classroom	100	3.3	0.843

Source: Field survey, 2025 (Average mean score= 3.44)

The provided table presents descriptive statistics (means and standard deviations) from a field survey of 100 respondents in 2025 on specific items measuring perceived effectiveness of the flipped classroom model. These items focus on student-centered outcomes, such as application of concepts, performance on assessments, retention, differentiated learning for diverse needs, and problem-solving abilities.

Thus, the average mean score of 3.44 reveals moderately positive perceptions among the surveyed teachers regarding the effectiveness of the flipped classroom. Teachers generally agree that the approach benefits students in areas like concept application, assessment performance, retention, differentiation, and problem-solving.

DESCRIPTIVE STATISTICS

Examining the implementation, challenges and recommendation of flipped classroom models.

Research Question: To what extent do learning management system features support the implementation of flipped classroom models?

ITEM	N	MEAN	Std Deviation
Poor internet connectivity hinders flipped classroom implementation	100	3.45	0.497
My workload has increased significantly with flipped classroom.	100	2.75	1.042
Students lack access to devices at home for pre-class learning	100	2.6	1.237
I would recommend flipped classroom to other teachers	100	3.45	0.497
More collaborative time should be allocated for teachers to develop materials	100	3.4	0.794
Technical training on LMS platforms would improve implementation	100	3.35	1.648

Source: Field Survey, 2025 (Average Mean score= 3.8)

The research question examines to what extent Learning Management System (LMS) features support the implementation of flipped classroom models. This involves assessing how well LMS tools (e.g., content uploading, assignment distribution, quizzes, discussion forums, tracking progress) facilitate or enable flipped learning practices, such as delivering pre-class instructional materials, enabling self-paced learning, and supporting in-class active/collaborative activities. The 3.8 average reveals a moderately positive overall perception that LMS features (and related conditions) provide reasonable support for implementing flipped classroom models — but with notable limitations and barriers that temper full endorsement.

Overall, the 3.8 average mean score indicates that LMS features support flipped classroom implementation to a moderate extent — enough to make it viable and worth recommending in many cases, but not without meaningful challenges (especially connectivity, training, and preparation demands) that reduce the extent of seamless or highly effective support. Teachers appear to view LMS as a helpful but imperfect enabler rather than a fully robust or problem-free foundation for flipped models in their context (likely influenced by resource constraints in the study setting).

DISCUSSION OF FINDING

The discussion of findings examines the results of this study in relation to the research questions posed, situating the outcomes within the broader context of existing empirical literature on flipped classroom models and Learning Management Systems. The analysis of descriptive data from 100 integrated science teachers in Egor, Benin City, yielded four clusters of findings, each of which is discussed in turn below.

Research question 1

Teachers' Perceptions of Flipped Classroom Implementation Practices

The first research question sought to determine teachers' perceptions of the effectiveness of flipped classroom models. The data revealed a neutral to mildly negative average mean score of 2.37 across items related to implementation practices, with individual item means ranging from 2.25 to 2.50. These scores cluster around or marginally below the scale midpoint, suggesting that

the sampled teachers neither strongly affirmed nor strongly rejected the effectiveness of flipped classroom implementation in their professional context. Rather, they demonstrated a tempered, cautious endorsement that reflects the complex realities of adopting innovative pedagogies within the Nigerian secondary school system.

This finding aligns with the observations of Dusengimana et al. (2023), whose systematic review of flipped classroom research in higher education identified the reluctance of instructors to adapt to new roles as a significant implementation challenge. The relatively low mean scores on items such as frequent use of the flipped model (mean = 2.25) and time invested in preparing flipped classroom materials (mean = 2.25) corroborate this pattern, suggesting that teachers in this study may be aware of the approach but have not yet institutionalised it as a consistent instructional practice. Similarly, Fryling (2020) noted that successful flipped classroom implementation requires deliberate advance planning and infrastructural readiness, conditions that may be insufficiently met in the resource-constrained settings characterising many junior secondary schools in Egor.

Furthermore, the moderate mean score of 2.40 on the item assessing LMS use for student communication and progress monitoring suggests that while some teachers have begun integrating LMS platforms into their instructional routines, such integration remains inconsistent and underdeveloped. This finding resonates with the position of Muhammad et al. (2023), who observed that LMS utilisation, though broadly beneficial, is often undermined by technical difficulties, insufficient institutional support, and inadequate educator preparation. The overall picture that emerges from this cluster of findings is one of cautious, partial adoption rather than enthusiastic or systematic implementation — a reflection of the infrastructural, professional, and contextual barriers that characterise technology integration in Nigerian secondary education.

Research Question 2

Perceived Effectiveness of the Flipped Classroom for Student Engagement

The second research question examined the challenges teachers encounter when implementing flipped classroom models, framed partly through their perceptions of student engagement outcomes. Contrary to the muted endorsement of implementation practices, teachers reported

markedly more positive views regarding the flipped model's impact on student engagement, yielding an average mean score of 3.42. This positive orientation was most pronounced for items assessing student motivation (mean = 3.70) and active in-class engagement relative to traditional approaches (mean = 3.60), indicating that teachers observe meaningful gains in learner participation and enthusiasm when flipped strategies are applied.

These findings are consistent with the conclusions of Harris et al. (2024), who found that flipped pedagogy generated higher participation rates than traditional lectures, particularly among lower-performing students. The relatively strong mean score for student motivation (3.70) suggests that even in contexts where implementation is inconsistent, the student-centred, active-learning orientation of the flipped model generates observable motivational benefits. This corroborates the assertion of Karyne et al. (2021) that transitioning from passive to active learning environments enhances student engagement, provided appropriate scaffolding mechanisms are in place.

Additionally, the moderate agreement with items relating to pre-class preparation (mean = 3.30) and peer-to-peer learning (mean = 3.20) affirms that the flipped model encourages students to engage with content prior to class and to collaborate with peers during instructional sessions. This is significant in the context of integrated science education, where conceptual understanding is deepened through discussion, enquiry, and collaborative problem-solving rather than rote memorisation. The finding is reinforced by Awi et al. (2024), who demonstrated that LMS-scaffolded flipped classrooms foster improved comprehension, peer interaction, and active discussion among learners. Teachers in the present study appear to recognise these engagement benefits, even as they grapple with implementation challenges, suggesting that the pedagogical promise of the flipped model is perceptible to practitioners despite contextual constraints.

Research Question 3

Relationship Between Teacher Characteristics and Perceived Effectiveness for Student Learning Outcomes

The third research question investigated the relationship between teacher characteristics and their perception of flipped classroom effectiveness, particularly with respect to student learning

outcomes. The descriptive data yielded an average mean score of 3.44 across five outcome-related items, situating teacher perceptions in the moderately positive range. Items addressing differentiated learning support for diverse student needs (mean = 3.65) and the ability of the flipped model to enable better concept application (mean = 3.50) attracted the highest levels of agreement, while items on retention (mean = 3.30) and the development of problem-solving abilities (mean = 3.30) were also positively appraised.

The relatively high agreement with differentiated learning support (mean = 3.65) is theoretically coherent with Vygotsky's concept of the Zone of Proximal Development, which underpins the constructivist framework guiding this study. By delivering foundational content through LMS prior to class, the flipped model allows teachers to deploy face-to-face time for targeted, scaffolded interactions that address individual student needs — a form of differentiated instruction that traditional, uniform lecture formats cannot easily accommodate. This is consistent with Johnson and Mary (2024), who emphasised that digital tools in flipped classrooms support personalised feedback, progress tracking, and collaborative learning, all of which contribute to differentiated instructional support. The moderate agreement with assessment performance improvement (mean = 3.45) is consonant with findings from Ugwoke et al. (2018), who established empirical evidence of significant achievement gains among Nigerian tertiary students exposed to flipped classroom models on LMS, compared to those in conventional face-to-face settings. While the present study examines teacher perceptions rather than objective achievement measures, the alignment between teacher observations and empirical evidence from prior studies strengthens the credibility of these findings. Tatyana et al. (2022) similarly found that students in flipped classroom conditions demonstrated stronger practical skills and assessment performance than control group counterparts, further supporting the notion that the flipped model can enhance learning outcomes when adequately implemented.

Research Question 4

Extent of LMS Features in Supporting Implementation, Challenges, and Recommendations

The fourth research question examined the extent to which LMS features support the implementation of flipped classroom models. This cluster of items produced the highest average mean score of 3.80, reflecting a broadly positive assessment of LMS utility, tempered by the

identification of significant infrastructural and logistical challenges. The strong endorsement of recommendations such as advocating flipped classroom adoption to colleagues (mean = 3.45), allocating collaborative planning time for material development (mean = 3.40), and providing technical LMS training (mean = 3.35) indicates that teachers are generally convinced of the approach's merits and are oriented toward improving conditions for its implementation. However, the identification of poor internet connectivity as a primary barrier (mean = 3.45) is a finding of considerable contextual significance. Poor digital infrastructure represents one of the most persistent impediments to technology-enhanced pedagogy in sub-Saharan Africa, and this study confirms its salience in the Egor, context. This finding corroborates the broader literature on technology integration in Nigeria, which consistently identifies internet access, device availability, and electricity supply as structural challenges that constrain the practical deployment of LMS-supported instruction (Fryling, 2020; Muhammad et al., 2023). The moderately elevated mean for workload increase (mean = 2.75) also reflects Mehring's (2017) caution that flipped classrooms can generate substantial additional preparation demands for teachers, potentially undermining their willingness to sustain implementation over time.

The relatively lower mean for students' lack of home device access (mean = 2.60) warrants careful interpretation. While this score does not register as the most pressing barrier, it nonetheless represents an equity concern of significance in contexts where digital divides are prevalent. If a subset of students cannot access pre-class LMS materials due to limited device ownership or connectivity at home, the fundamental premise of the flipped classroom — that all students arrive at class with baseline content exposure — is compromised. This concern aligns with the equity and access gaps identified in the literature review, which note that flipped classroom research in developing contexts must account for unequal technology access among learners. Collectively, the discussion of findings affirms that flipped classroom models enhanced by LMS present a viable and theoretically well-grounded instructional alternative for junior secondary integrated science in Ugbowo, Benin City. Teachers recognise the engagement and learning outcome benefits of the approach and are broadly disposed toward its adoption. However, the path from pedagogical potential to consistent, equitable, and effective implementation is mediated by significant contextual barriers, including infrastructural deficits, workload pressures, and unequal learner access to digital resources. Addressing these barriers

through targeted policy interventions, institutional support, and professional development investments is essential for translating the promise of flipped LMS-enhanced pedagogy into sustained educational gains for Nigerian junior secondary school students.

CHAPTER FIVE
SUMMARY, CONCLUSION, AND RECOMMENDATIONS

Summary

This study investigated teachers' perceptions of the effectiveness of flipped classroom models enhanced by Learning Management Systems (LMS) for teaching integrated science at the junior secondary school level in Egor Local Government, Edo State, Nigeria. The study was guided by five research questions addressing teacher perceptions of effectiveness, implementation challenges, the relationship between teacher characteristics and perceived student learning outcomes, the extent of LMS feature support, and recommendations for optimising implementation. A descriptive survey research design with mixed-methods components was adopted, and data were collected from 100 integrated science teachers through a structured questionnaire administered during the 2024/2025 academic session. Descriptive statistics — including means and standard deviations computed via SPSS version 26 — were employed for analysis, using a four-point Likert scale (Strongly Agree = 4, Strongly Disagree = 1). The study was anchored on Constructivist Learning Theory, Bloom's Revised Taxonomy, and the Community of Inquiry (CoI) Framework. These theoretical lenses collectively explain how flipped classrooms restructure the learning environment to privilege active knowledge construction, higher-order thinking, and collaborative inquiry — goals that are central to effective science education at the junior secondary level. A thorough review of related literature revealed significant knowledge gaps with respect to flipped classroom research in sub-Saharan African contexts, at the secondary school level, from teacher perspectives, and with specific reference to the integrated science curriculum. This study was designed to address these gaps by providing empirical evidence from the Nigerian educational setting.

The Findings of the Study Revealed That:

1. Teachers' overall perception of flipped classroom implementation practices was neutral to mildly negative, with an average mean score of 2.37. Individual item means ranged from 2.25 to 2.50, clustering around or slightly below the scale midpoint of 2.50. This finding indicates that, while teachers in Egor are aware of and have some exposure to the flipped classroom approach, its routine, systematic, and high-impact implementation remains limited. High preparation demands, inconsistent LMS use, and contextual constraints were reflected in the cautious endorsement observed across implementation practice items.

2. Teachers perceived the flipped classroom model as moderately to quite effective in enhancing student engagement, yielding an average mean score of 3.42. The approach was associated with increased student motivation (mean = 3.70), greater active participation during class compared to traditional methods (mean = 3.60), improved pre-class preparation (mean = 3.30), and enhanced peer-to-peer learning (mean = 3.20). These findings suggest that, notwithstanding implementation challenges, the flipped model generates observable engagement benefits that teachers recognise and value.

3. With respect to the relationship between teacher characteristics and perceived student learning outcomes, teachers held moderately positive views, with an average mean score of 3.44. The flipped model was perceived to support differentiated learning for diverse student needs (mean = 3.65), enable better concept application (mean = 3.50), improve assessment performance (mean = 3.45), enhance information retention (mean = 3.30), and develop problem-solving abilities (mean = 3.30). These findings suggest that teachers who engage with the flipped approach, regardless of their professional characteristics, tend to perceive positive downstream effects on student learning.

4. LMS features were perceived to provide moderate-to-substantial support for flipped classroom implementation, with the highest average mean score of 3.80 recorded across items in this cluster. However, critical barriers were identified: poor internet connectivity was rated as the most significant implementation hindrance (mean = 3.45), followed by increased teacher workload (mean = 2.75) and students' limited access to devices at home (mean = 2.60). Despite these challenges, teachers strongly endorsed recommending the approach to colleagues (mean = 3.45), advocated for collaborative planning time (mean = 3.40), and recognised the importance of technical LMS training for improving implementation quality (mean = 3.35).

Conclusions

Based on the foregoing findings, the following conclusions are drawn:

Flipped classroom models enhanced by LMS hold moderate but demonstrable promise for improving the quality of integrated science instruction at the junior secondary school level in Egor Local Government, Benin City. Teachers' perceptions confirm that the approach generates meaningful gains in student engagement, motivation, and active participation, which are foundational preconditions for deeper learning. The alignment of these perceptions with well-established theoretical frameworks — particularly Vygotsky's constructivism and Bloom's Revised Taxonomy — reinforces the pedagogical soundness of the flipped model as an instructional strategy for science education. However, the study also concludes that the effectiveness of flipped LMS-enhanced instruction in the Nigerian context is substantially mediated by infrastructural, professional, and equity-related conditions. The neutral-to-negative perceptions of overall implementation practices reveal a critical implementation gap — one that is not attributable to scepticism about the model's potential, but rather to the practical barriers that prevent consistent and quality implementation. Poor internet connectivity, inadequate teacher training on LMS platforms, heavy preparation workloads, and unequal student access to digital devices at home constitute the primary constraints that must be systematically addressed for the flipped model to transition from peripheral experimentation to mainstream instructional practice. It is further concluded that Nigerian junior secondary school teachers are broadly disposed toward adopting flipped classroom models and LMS-enhanced instruction, as evidenced by their willingness to recommend the approach to peers and their support for collaborative material development and technical training. This positive disposition represents an important enabling factor that educational stakeholders can leverage in designing professional development and institutional support programmes. With targeted intervention, the flipped classroom model enhanced by LMS can serve as a viable, context-sensitive strategy for advancing the National Policy on Education's ICT integration objectives and supporting the educational transformation agenda of initiatives such as EdoBEST in Edo State.

Recommendations

Based on the conclusions drawn from this study, the following recommendations are made:

1. To Teachers: Integrated science teachers at the junior secondary school level are encouraged to adopt the flipped classroom model incrementally, beginning with a hybrid approach that introduces selected topics through LMS-delivered pre-class video lessons and readings before dedicating class time to active, problem-solving activities. Gradual adoption allows teachers to build competence and confidence with flipped instruction without being overwhelmed by the initial workload demands associated with wholesale curriculum redesign.

2. To School Administrators: School administrators should create structural conditions that facilitate flipped classroom implementation by scheduling dedicated collaborative planning periods for teachers to co-develop and share instructional materials. Reducing the individual preparation burden through collaborative content creation is essential for sustainable adoption. Administrators should also ensure that adequate technical infrastructure — including reliable internet connectivity, school-based computer laboratories, and tablet lending schemes — is available to support both teacher preparation and student pre-class content access.

3. To the Edo State Government and Ministry of Education: Government stakeholders are urged to invest in reliable broadband internet infrastructure across secondary schools in Egor Local Government Area, Benin City more broadly, as poor connectivity constitutes the single most significant barrier to flipped classroom implementation identified in this study. Furthermore, the EdoBEST programme should incorporate structured LMS training modules into its teacher professional development framework, ensuring that integrated science teachers acquire the technical competencies necessary to effectively utilise platforms such as Google Classroom, Moodle, and related tools.

4. To Curriculum Developers and Policymakers: Curriculum developers should integrate flipped LMS-enhanced instructional strategies into revised junior secondary science curriculum guidelines and teacher education programmes at the preservice and in-service levels. Context-sensitive implementation guidelines that account for Nigerian infrastructural realities — such as recommendations for offline LMS functionality and low-bandwidth content formats — should be developed to promote equitable adoption across diverse school settings. Policy frameworks

should formally recognise and incentivise technology-enhanced pedagogical innovation as a core component of quality science education at the junior secondary level.

5. To Educational Technology Providers: Technology companies offering LMS platforms in the Nigerian market should invest in developing offline-capable, mobile-optimised versions of their products that are functional under low-connectivity conditions. Afrdordable device bundling programmes in partnership with state governments would help to address the student device access gap identified in this study. Platform developers are further encouraged to offer localised, culturally responsive training and onboarding support tailored to the specific needs and constraints of Nigerian secondary school teachers.

Suggestions for Further Studies

This study, while providing valuable empirical insights into teacher perceptions of flipped classroom effectiveness in a specific Nigerian context, is not without limitations. The findings are based on self-reported perceptual data from a purposive sample of teachers in one geographically delimited area, and therefore cannot be uncritically generalised to other educational contexts. The following suggestions are offered to guide future research efforts in this domain:

1. Future studies should employ experimental or quasi-experimental designs to examine the causal effects of flipped classroom models enhanced by LMS on directly measured student learning outcomes in integrated science, such as pre-test and post-test achievement scores, rather than relying solely on teacher perceptual data. Such designs would provide stronger evidence for causal inference and enable clearer conclusions about the efficacy of the approach.

2. Research with larger, more diverse samples drawn from multiple local government areas, states, or geopolitical zones in Nigeria is recommended to enhance the representativeness and generalisability of findings. Comparative studies examining differences in flipped classroom effectiveness across public and private schools, urban and rural settings, and regions with varying levels of digital infrastructure would provide important equity-related insights.

3. Longitudinal studies tracking teacher adoption, student engagement, and learning outcomes over multiple academic sessions would be valuable in assessing whether the benefits of flipped classroom models are sustained over time and whether teacher confidence and implementation quality improve with accumulated experience.

4. Future research should incorporate the perspectives of students and school administrators alongside teacher perceptions to provide a more holistic, multi-stakeholder assessment of flipped classroom effectiveness. Student-reported experiences, engagement levels, and academic performance data would complement teacher observations and enrich the evidence base for policy and practice.

5. Studies examining the effectiveness of flipped classroom models for other subjects in the Nigerian junior secondary curriculum — such as mathematics, basic technology, and social studies — are needed to determine the cross-disciplinary applicability and scalability of the approach. Subject-specific investigations would inform curriculum policy by identifying the disciplinary contexts in which flipped LMS-enhanced models yield the greatest instructional benefits.

6. Research specifically addressing interventions designed to mitigate the workload burden and digital divide challenges identified in this study — such as offline LMS pilot programmes, collaborative content repositories, or blended professional development models — would generate actionable evidence for implementation practitioners and policymakers seeking to scale flipped classroom adoption under Nigerian resource constraints.

References

Ang, K. C. S., Afzal, F., & Crawford, L. H. (2021). Transitioning from passive to active learning: Preparing future project leaders. Project Leadership and Society, 2, 100016.

Attard, C., & Holmes, K. (2022). An exploration of teacher and student perceptions of blended learning in four secondary mathematics classrooms. Mathematics Education Research Journal, 34, 719–740. https://doi.org/10.1007/s13394-020-00359-2

Awi, M. A. N., Sutamrin, S., & Huda, M. (2024). Enhancing geometry achievement in pre-service mathematics teachers: The impact of a scaffolded flipped classroom using a learning management system. Journal of Ecohumanism, 3(6), 637–645.

Bishop, J. L., & Verleger, M. A. (2013, June 23–26). The flipped classroom: A survey of the research [Paper presentation]. 120th ASEE Annual Conference & Exposition, Atlanta, GA, United States.

Boyd, D. (2016). What would Paulo Freire think of Blackboard™: Critical pedagogy in an age of online learning. International Journal of Critical Pedagogy, 7(1), 165–186.

Carroll, A. J., Tchangalova, N., & Harrington, E. G. (2016). Flipping one-shot library instruction: Using Canvas and Pecha Kucha for peer teaching. Journal of the Medical Library Association, 104(2), 125–130. http://dx.doi.org/10.3163/1536-5050.104.2.006

Clark, K. R. (2015). The effects of the flipped model of instruction on student engagement and performance in the secondary mathematics classroom. Journal of Educators Online, 12(1), 91–115.

Czerniewicz, L., Trotter, H., & Haupt, G. (2019). Online teaching in response to student protests and campus shutdowns: Academics' perspectives. International Journal of Educational Technology in Higher Education, 16(43). https://doi.org/10.1186/s41239-019-0170-1

Dusengimana, C., Munyemana, J. J., & Mugabe, G. (2023). Trends in the use of flipped classroom model and its effectiveness in higher learning education: A systematic review. African Educational Research Journal, 11(4), 616–633. https://doi.org/10.30918/AERJ.114.23.096

Fryling, M. (2020). From flipped, to flipping out, to mostly sunny: How the flipped classroom model made the move to emergency remote learning less stormy. Issues in Information Systems, 21(1), 281–289. https://doi.org/10.48009/1_iis_2020_281-289

Furqon, M., Sinaga, P., Liliasari, L., & Riza, L. S. (2023). The impact of learning management system (LMS) usage on students. TEM Journal, 12(2), 1082–1089. https://doi.org/10.18421/TEM122-54

Harris, E. N., Schroder, E. A., & Berks, T. J. (2024). Student comprehension of biochemistry in a flipped classroom format. Smart Learning Environments, 11, Article 15. https://doi.org/10.1186/s40561-024-00356-z

Hassan, T. (2022). Mining the frequent use-contexts of learning management system tools and assessing their impact on learning outcomes.

Jayasekaran, S. R., Anwar, S., Cho, K., & Ali, S. F. (2022, August). Relationship of students' engagement with learning management system and their performance—An undergraduate programming course perspective [Paper presentation]. 2022 ASEE Annual Conference & Exposition, Minneapolis, MN, United States.

Khoo Mei Sui, L., Loke Abdullah, N., Balakrishnan, S., & Meor Osman, W. S. (2024). Students' perceptions of its usefulness and ease of use on learning management system. International Journal of Advanced Computer Science and Applications, 15(7), 487–495.

Litvinova, T. M., Budenkova, E. A., Babaskina, L. I., Glazkova, I. Y., & Babaskin, D. V. (2022). The effectiveness of flipped classroom during the COVID-19 pandemic in higher pharmaceutical education. Open Access Macedonian Journal of Medical Sciences, 10(E), 1199–1208. https://doi.org/10.3889/oamjms.2022.8495

Mary, B. J. (2024). The role of digital tools in the flipped classroom enhancing attendance and academic performance.

Mehring, J. (2017). Technology as a teaching and learning tool in the flipped classroom. In M. Carrier, R. Damerow, & K. M. Bailey (Eds.), Digital language learning and teaching: Research, theory and practice (pp. 67–78). Routledge & TIRF.

Mercer, J. (2024). A modified flipped classroom: Action research using an in-class flip to measure student achievement and perceptions within a high school multimedia course [Doctoral dissertation, University of South Carolina]. Scholar Commons. https://scholarcommons.sc.edu/etd/7764

Navarrete, C. C., & Fazal, M. (2023). Case study of online flipped learning in higher education. Excelsior: Leadership in Teaching and Learning, 15(2), 214–229. https://doi.org/10.14305/jn.19440413.2023.15.2.06

Panda, S. (2020). Analyzing effectiveness of learning management system in present scenario: Conceptual background and practical implementation. International Journal of Innovative Research and Advanced Studies, 7(9), 43–52.

Poulain, P., Bertrand, M., Dufour, H., & Taly, A. (2022). A field guide for implementing a flipped classroom. Biochemistry and Molecular Biology Education, 50(6), 637–647. https://doi.org/10.1002/bmb.21737

Sari, N. M., Yin, K. Y., & Zakariya, Z. (2024). The effect of Google Classroom-assisted learning on the academic achievement of students. International Journal of Academic Research in Business and Social Sciences, 14(4), 1314–1325. http://dx.doi.org/10.6007/IJARBSS/v14-i4/21165

Ugwoke, E. O., Edeh, N. I., & Ezemma, J. C. (2018). Effect of flipped classroom on learning management systems and face-to-face learning environments on students' gender, interest and achievement in accounting. Library Philosophy and Practice, Article 1875. http://digitalcommons.unl.edu/libphilprac/1875

Webb, M., & Doman, E. (2020). Impacts of flipped classrooms on learner attitudes towards technology-enhanced language learning. Computer Assisted Language Learning, 33(3), 240–274. https://doi.org/10.1080/09588221.2018.1557692

APPENDICES

DEPARTMENT OF CURRICULUM AND INSTRUCTIONAL TECHNOLOGY, FACULTY OF EDUCATION, UNIVERSITY OF BENIN, BENIN CITY.

QUESTIONNAIRE

EFFECTIVENESS OF FLIPPED CLASSROOM MODELS ENHANCED BY LEARNING MANAGEMENT SYSTEMS (LMS) FOR TEACHING JUNIOR SECONDARY SCHOOL IN EGOR LOCAL GOVERNMENT AREA.

Dear Participant,

My name is I**JUO VERA OMAHI**, a student of the above department, conducting a study on EFFECTIVENESS OF FLIPPED CLASSROOM MODELS ENHANCED BY LEARNING MANAGEMENT SYSTEMS (LMS) FOR TEACHING JUNIOR SECONDARY SCHOOL IN EGOR LOCAL GOVERNMENT. I hereby solicit your honest responses. All information provided will be treated with strict confidentiality. Your participation is voluntary.

Response Format: The questionnaire employs a **modified 4-point Likert scale** for perception and attitude items, eliminating the neutral midpoint to encourage definite positioning. Response options are:

- Strongly Agree (SA) = 4 points
- Agree (A) = 3 points
- Disagree (D) = 2 points
- Strongly Disagree (SD) = 1 point

This 4-point scale was chosen over 5-point scales with neutral options to prevent respondents from avoiding commitment by selecting middle options, thereby obtaining clearer data on teacher perceptions.

S/N	ITEMS	SA	A	D	SD
	Section A: Flipped Classroom Implementation Practices				
1	You frequently use the flipped classroom model?				
2	You engage students in problem-solving activities during class and conduct hands-				

	on experiments				
3	You provide reading materials and video lessons as pre-class content to facilitate group discussions				
4	You use LMS for communication with students and monitor student progress through assessment				
5	You spend much time preparing flipped classroom materials per week.				
	Section B Perceived Effectiveness for Student Engagement				
6	Students are more motivated to learn when using flipped classroom approaches				
7	Students are more actively engaged during class time in flipped classroom compared to traditional approaches				
8	Flipped classroom increases student preparation before class				
9	The flipped model encourages peer-to-peer learning among students				
10	LMS features enhance student engagement in the flipped classroom and also encourages students ask more thoughtful questions				
	Section C; Perceived Effectiveness for				

	Student Learning Outcomes				
11	Flipped classroom enables students to apply concepts more effectively				
12	Student performance on assessments improves with flipped classroom approach				
13	Flipped classroom helps students retain information longer				
14	The flipped model supports differentiated learning for diverse student needs				
15	Students develop better problem-solving abilities with flipped classroom				
	Section D implementation challenges and recommendation				
16	Poor internet connectivity hinders flipped classroom implementation				
17	My workload has increased significantly with flipped classroom.				
18	Students lack access to devices at home for pre-class learning				
19	I would recommend flipped classroom to other teachers				
20	More collaborative time should be allocated for teachers to develop materials				
21	Technical training on LMS platforms				

	would improve implementation				