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EDITORIAL

The educational landscape is undergoing transformative changes, particularly in Nigeria, where the integration of technology into teaching and learning processes has become a necessity rather than a luxury. The contributions in this edition highlight contemporary issues, innovative practices, and the critical need for educational reforms that align with global trends.

This volume, 25, Number 1, of the Zaria Journal of Educational Studies (ZAJES), reflects on the pivotal role education plays in shaping societies and nurturing individual potential. The volume features a diverse range of studies that explore essential themes in educational research, including the effectiveness of educational games in teaching entrepreneurial values, the integration of Information and Communication Technology (ICT) in agricultural education, and the impact of micro-courseware on teacher training. Each of these contributions underscores the importance of equipping both educators and learners with the skills necessary to thrive in an increasingly digital world.

The importance of fostering an inclusive and supportive educational environment cannot be overstated. As educators, we bear the responsibility of imparting knowledge, and also fostering critical thinking, creativity, and adaptability among our students. The studies presented in this volume encourage us to rethink traditional pedagogical approaches and embrace innovative strategies that engage learners and enhance their educational experiences.

Moreover, the significance of interfaith dialogue and understanding in Christian education is a recurrent theme that resonates throughout this issue. In our globalized world, the ability to navigate diverse cultural and religious landscapes is essential. By incorporating digital storytelling into educational practices, we can create spaces for empathy, reflection, and meaningful discussions that bridge gaps between different faith traditions.

By the publiblication of this volume, we reaffirm our commitment to advancing educational research and practice. We invite our esteemed readers—educators, researchers, policymakers, and students—to engage with the findings presented herein. Together, let us strive for a future where education serves as a catalyst for positive change, empowering individuals and communities to navigate the complexities of the modern world.

Finally, I am grateful to the contributors, the editorial board, and our readers for their unwavering support. May this volume inspire continued discourse and innovation in educational practices, ultimately leading to a more equitable and enlightened society.

Ilesanmi Ajibola, PhD
Editor-in-Chief
ZAJES
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FOREWORD

It is with great pleasure that we present the latest edition of the *Zaria Journal of Educational Studies* (ZAJES). This journal has long been a platform for scholarly dialogue, reflecting the evolving landscape of education and the myriad challenges we face in our quest for academic excellence.

As we delve into this volume, it is crucial to recognize the transformative power of education. The articles featured herein highlight significant advancements and insights in various fields, from the integration of technology in teaching to the necessity of fostering entrepreneurial skills among students. The diverse perspectives offered by our authors serve as a testament to the rich tapestry of ideas that characterize our educational community.

This volume underscores the importance of adapting our educational practices to meet the demands of a rapidly changing world. The research presented here focuses not only on theoretical frameworks but also on practical applications that can enhance students' and teachers' engagement and educational outcomes. In particular, the emphasis on educational games and micro-courseware reflects a growing recognition of the need for innovative teaching strategies that resonate with 21st-century learners.

Furthermore, the exploration of interfaith dialogue within the context of Christian education is particularly timely. As our societies become increasingly multicultural, the ability to engage with diverse perspectives is vital. The contributions in this volume urge us to embrace inclusivity and foster environments where dialogue and understanding can flourish.

As we move forward, I encourage all stakeholders in the education sector to leverage the knowledge and insights shared in this journal. It is our collective responsibility to ensure that education remains a beacon of hope and progress, guiding future generations toward a brighter and more equitable future.

Conclusively, I express my sincere appreciation to all authors, reviewers, and supporters of ZAJES, as well as our funder, TETFund. Your commitment to advancing educational research is invaluable, and it is my hope that this volume inspires further inquiry and collaboration in our ongoing pursuit of academic excellence.

Dr Suleiman Balarabe
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Zaria, Kaduna State, Nigeria

BRIEF INFORMATION ABOUT THE JOURNAL

The Zaria Journal of Educational Studies (ZAJES) is the official academic journal published by the Federal College of Education in Zaria, Nigeria. The journal was established in 1988 when the College was still part of Ahmadu Bello University, Zaria. Since its inception, ZAJES has served as an important platform for scholars and practitioners in various fields of Education to publish their research findings, perspectives, and responses to prior work. Recognizing the journal's high standards, the Tertiary Education Trust Fund (TETFund) of Nigeria began to sponsor the production of its issues in 2010.

Mission

The mission of ZAJES is to promote and disseminate high-quality research in Education. The journal seeks to publish papers that are theoretically sound, methodologically rigorous, and relevant to the needs of the education community. ZAJES also aims to provide a forum for exchanging ideas and perspectives on the most pressing issues in Education.

Scope

ZAJES welcomes submissions on any topic related to Education. To help readers easily find relevant papers, articles are grouped into five broad subject areas:

- Arts and Social Science Education
- language and Literature Education
- Science and Mathematics Education
- Trends and Innovations in Education
- Vocational and Technical Education

Peer Review Process

All papers submitted to ZAJES undergo an initial online similarity check (plagiarism test) and would only consider articles with 15% or less online similarity results and 5% same source similarity level. Accepted papers are further subjected to a rigorous peer review process. Each paper is reviewed by at least two experts in the field. The reviewers provide feedback on the paper's strengths and weaknesses and recommend revision. The editors of ZAJES then decide whether to accept or reject the paper.

Publication Process

Accepted papers are published in two issues per year. The journal is indexed in several major bibliographic databases.

Disclaimer

While the journal publishes a diversity of well-researched ideas and opinions, the contents do not necessarily reflect the publisher's or editorial board's views. The responsibility for the accuracy and originality of the papers lies entirely with the contributing authors. However, through its rigorous peer review and editorial processes, ZAJES strives to maintain high academic standards and serve as a valuable resource for the education community.

EDITORIAL POLICY

The Editorial Board of Zaria Journal of Educational Studies (ZAJES) invites papers from interested stakeholders in education for publication in the journal. The paper may focus on analytical research, research reports, replicated research, research notes, descriptive research, book reviews, etc, from any of the following areas in Education:

- Adult and Non-formal Education
- Citizenship Education
- Computer Information and Communication Technology (ICT)Education
- Continuing/Distance Education
- Creative Arts Education
- Curriculum Planning and Development
- Educational Management/Administration, Planning and Supervision
- Health and Physical Education
- Language and Literature Education
- Measurement and Evaluation
- Library and Information Management
- Nomadic and Disadvantaged Peoples' Education
- Philosophy and Sociology of Education
- Family Life Education
- Pre-Primary, Primary, Secondary and Higher Education
- Psychology and Counselling
- Religious and Moral Education
- Science, Technology and Mathematics Education
- Social Science Education
- Special and Rehabilitative Education
- Vocational and Technical Education

Guidelines for Paper Preparation

Manuscripts:

- must be written in English or any other acceptable language and should be scholarly, original and contribute to knowledge.
- must not have been published or under consideration for publication in any other journal. Once a paper is accepted for publication in ZAJES, the author(s) cede copyright to the journal's publisher.
- should clearly state on its front cover page the title of the paper, the author’s name(s), their status/rank, and institutional affiliation. The next page should also begin with the paper's title (but no author's name), followed by an abstract of not more than 150 words.
- should be computer typed on one side of the paper, using a font size of 12 double-spaced for the main work and single line spacing for the abstract should not exceed 12 pages of A4 paper, including abstract, references appendices: and Tables, figures, and diagrams, where applicable, should be simple, camera-ready and kept to the barest minimum to facilitate printing.

References

The current American Psychological Association (APA) citation style (7th edition) is the accepted style for the journal. It should be cited as follows:

In-Text Citation

An in-text citation should be deployed when the author quotes a source or paraphrases another work in their own words. These could be in the article's narrative or as a parenthetical citation. See the examples below.

Narrative Citation

The narrative citation should be used when an author's work or quote is cited alongside their name. For example, The impact of colonial missionary activities on Igbo socio-cultural activities is well captured by Achebe (2009), who observed that "The white man is very clever. He came quietly and peaceably with his religion. We were amused at his foolishness and allowed him to stay. Now, he has won over our brothers, and our clan can no longer act like one. He has put a knife on the things that held us together, and we have fallen apart" (p.81).

Parenthetical Citation

This form of citation is used when someone else's work or idea is paraphrased as a summary or synthesis in one's own words.

For example, Achebe (2009) narrates the development of the negative effect of colonial influence on African culture in *Things Fall Apart* (p.81). Or,

The radical factor for the disconnect between the *de iure* and *de facto* African family system is the unbridled assimilation of western culture by Africans (Achebe, 2009).

Book

Achebe, C (2009). *Things Fall Apart*. Penguin Books.

Chapter in an Edited Book

Swindler, L (2013). The History of Inter-Religious Dialogue. In C. Cornille (Ed.), *The Wiley-Blackwell Companion to Inter-Religious Dialogue*. Wiley-Blackwell: A John Wiley & Sons, Ltd., Publication.

Journal

Maccido, M. I (1997). Recreational Activities in Federal University of Education, Zaria Academic Staff. *Zaria Journal of Educational Studies*. 2 (1), 166-172.

Conference Proceedings

Ikenga, G. U (2015). Education in 100 Years of Nigeria's Existence: The Needs and Benefits of Public Private Partnerships in Education. *Proceedings of The IRES 3rd International Conference*, 74–78.

Projects/Thesis/Dissertations

Ajibola, I (2018). *A Theological Analysis of Confessional-Centric Curriculum of Christian Religious Education: Towards an Inclusive Religious Pluralistic Centred Curriculum for Nigeria Colleges of Education*. Doctoral dissertation, Duquesne University, Pittsburgh, PA, USA.

Type of Citation	Narrative Format	Parenthetical Format
Single author	Achebe (2009)	(Achebe, 2009)
Two authors	Soyinka and Anyebe (2009)	(Soyinka & Achebe, 2009)
Three or more authors	Achebe et al. (2009)	(Achebe et al., 1999)

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CONTENTS

CLOUD-BASED EXAMINATION: ENHANCING SECURITY AND EFFICIENCY IN NIGERIAN TERTIARY INSTITUTIONS

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Cloud Computing offers the use of computing resources over the internet without having the infrastructure. The main content of cloud computing is to tackle software program, data storage and processing potential allocated to external users on demand through the World Wide Web and pay-as-you-use. Information security is a major concern in any communication system, especially on the cloud platform. Examinations are a routine process used to assess the effect of students' learning skills in universities and colleges of education. Nowadays, it consumes more time and resources in organizing and preparing the examination materials, printing papers, scheduling the examination and as a whole organizing the examination. The procedure of picking out questions automatically from the database reduces the time cost of preparing paper-based for teachers or lecturers, the control of the exam time and the submission makes the invigilating easier, the checking of the result automatically lightens the teacher burden and the same time also increase the accuracy. This paper examines the implementation of a cloud-based examination framework, focusing on its capacity to strengthen security measures and minimize administrative workloads in educational institutions.

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- Examination
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Introduction

An innovative technology aiming to reduce the abnormalities frequently connected to conventional evaluation procedures is the use of cloud computing technologies into examination systems (Song, 2021). Using cloud-based solutions has become an essential approach for increasing security and efficiency as educational institutions work to improve their assessment processes. The necessity to have skilled workers that can support economic growth is what motivates the desire for strong educational frameworks, especially in tertiary institutions (Mabele, 2018). Educational institutions can simplify their test procedures by using cloud computing's scalable resources, which enable effective data management and storage. Exam questions stored in a centralised database enhance accessibility while ensuring that assessments meet institutional requirements. This technique saves teachers time on preparation and assessment, which is particularly essential in higher education since faculty members frequently balance their responsibilities related to research and teaching.

In paper-based examinations, institutions deal with issues such as inadequate responses, delayed data analysis, and constrained capability of obtaining input from numerous evaluators. These limitations hinder assessment's overall effectiveness and delay student feedback, which eventually affects the learning process (Morris et al., 2021). Cloud-based platforms minimise logistical obstacles and enhance the exam experience for students as well as instructors because they can support large numbers of users at once and offer the

scalability required to manage peak demands during exams (Chatterjee et al., 2022; Matthew et al., 2018).

An important consideration in a communication system is information security, especially in online testing platforms that handle sensitive student data. The chances of unauthorize access or data breaches can be reduced by implementing robust security measures in place, such as encryption methods, access limits, and frequent security audits. This will ensure data privacy and secure student information. These security measures ensure the reliability of academic evaluations and the accuracy of the examination process, particularly at higher education institutions. (Arsalan & Ali, 2024; Mohammad, 2024).

Problem Statement

The implementation of centralized databases in cloud-based examination systems within Nigerian educational institutions faces significant security challenges that undermine the integrity of educational assessments. One major issue is the lack of robust authentication mechanisms; many institutions do not utilize advanced security features such as biometric verification, including facial recognition and thumbprint scanning, which can lead to unauthorized access to sensitive examination data. This vulnerability allows individuals without proper credentials to manipulate exam materials, compromising the integrity of the assessment process. Additionally, insufficient data encryption protocols further expose sensitive information during transmission and storage. The absence of strong encryption standards increases the risk of data interception and unauthorized access, jeopardizing the confidentiality of examination processes. (Awoniyi et al., 2024; Garg & Goel, 2022). These challenges highlight the need for more efficient and secure examination systems.

This research aims to address these concerns by proposing a cloud-based examination system that provide valuable insights for educators, administrators, and policymakers in implementing secure, technology-driven examination processes.

A review of related literature

According to Song (2021), an examination system is a database-driven program that stores records of test paper details, questions bank data, and user information. A computer connected to a network is used to administer an online test. Because of its speed and efficiency, online examination systems are currently a rapidly growing examination method. The examination can be conducted by the system with little human intervention. In order to save students time during tests, almost all organisations now use online examination systems. A student's performance on an exam can also be easily verified by organisations. Consequently, organisations are releasing results faster. By saving paper, it also benefits the environment (Tripathi et al., 2022). Examinees in online systems receive their login information and password along with their admission card. The examination server has this ID saved already. When the examinee logs in to the server, their profile is already registered. The notification to begin the examination is sent to the examinee at an appointed time. Each answer submitted by the examinee is stored on the server together with their profile details. The online exam method also permits the examinee to revise their response if necessary within the exam period; however, after the allotted time, no revisions will be permitted. Because computers are faster and more accurate than humans, this further makes checking the response simple and error-proof (Akazua et al., 2016).

Numerous studies have recommended technological improvements to improve the online exam experience. A comprehensive review of the literature on virtual testing, for example, demonstrated how technology might enhance academic integrity by monitoring students' behaviour during exams (Muzaffar & Tahir, 2024). To effectively identify instances of cheating, an automated online exam testing system that collects multimedia data was also put into place. As the need for comprehensive solutions that consider security and user experience issues grows, so do these technological advances.

Chan and Ahn found that unsupervised online test scores were comparable to proctored in-person exam scores. According to this study, which looked at data from almost 2,000 students in a range of academic areas, student rankings remained consistent across exam formats. According to the findings, online assessments can provide accurate assessments of students' learning, refuting the misconceptions about how reliable online testing settings are in emergency situations (Chan & Ahn, 2023).

Biccard et al. (2023) looked into students' perceptions of the first online exams administered during the pandemic. According to the study, key factors influencing student achievement include online access, exam size, and system interface usability. Students brought up problems including not having enough time to complete assignments and experiencing difficulties obtaining reliable internet connections. The authors emphasised the significance of educational institutions providing adequate support and resources to facilitate successful online assessments.

According to a thorough assessment of online exam solutions by Muzaffar et al. (2021), one important aspect of the examination system was its usability. Still, it was the least researched idea over the preceding five years. Based on the findings of these authors, a system that has strong usability is easy to use and does not require additional training.(Muzaffar et al., 2021a).

As a result of a sudden transition to online learning, many learners experienced anxiety, according to Fawaz and Samaha (2020). They also highlight the emotional discomfort experienced by students who were not accustomed to online learning. Students may experience anxiety when they visit the online exam environment, especially if they are unfamiliar with or find the interface challenging to use. Anxiety is the main cause of the digital divide (van Dijk, 2002, 2017) and may compound issues with usage, skills, or resource access.

A review by Newton and Essex (2024) found that self-reported cheating rates among college students increased from 29.9% earlier in COVID-19 to 54.7% amid the pandemic. This alarming trend highlights the flaws in online assessments and highlights how important it is to use secure assessing services to maintain academic integrity.

Additionally, a systematic analysis by Muzaffar and Tahir (2024) examined a range of monitoring systems designed to detect cheating in real-time, showcasing developments aimed at enhancing online security (Muzaffar et al., 2021b).

Conclusively, online tests in higher education are complexly portrayed in the literature. Online assessments can be accurate, according to research, but there are still issues, especially when it comes to student attitudes, academic integrity, and effective technology use. As institutions adjust to these developments, more research will be required

to create techniques that enhance the security and integrity of online exam systems.

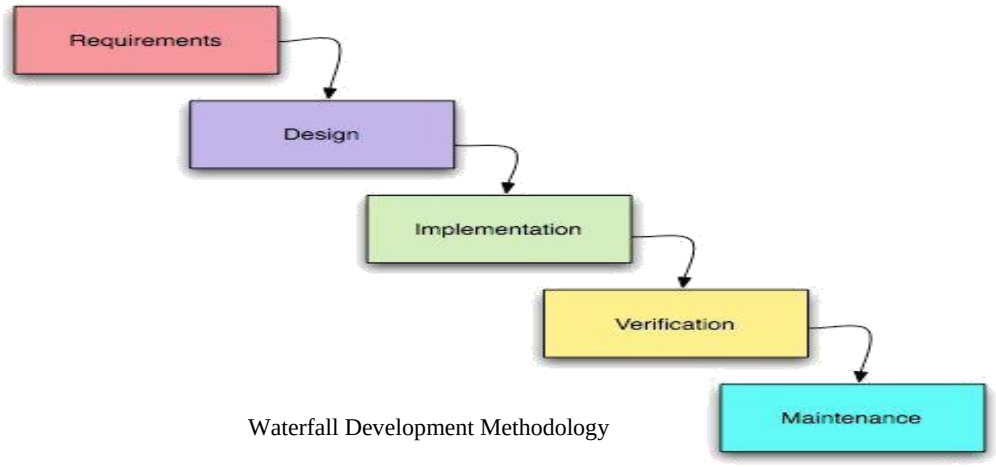
Methodology

This study uses a survey method that is administered electronically, and adopt software development methodology which require careful control due to the dynamic nature of requirements. This is necessity for collaboration, and the importance of documentation. In remote teams, a lack of structured development design and methodology can lead to project delays, as team members may frequently need to seek guidance from project managers, resulting in communication bottlenecks. This can force developers to rely on intuition, increasing the likelihood of bugs in the final product, which in turn consumes valuable time during debugging (Emenike et al., 2023). To address these challenges, many individuals and organizations have established documented phases or stages to standardize their development processes. Continuous refinement of these practices has led to the creation of methodologies that are widely adopted across different teams to enhance their development efficiency.

Software development methodology refers to a structured set of principles or practices used in the software creation process. The primary goal of any methodology is to maintain control over the development process by dividing it into distinct phases, each with specific deliverables. The selection of a suitable development methodology depends on various factors, including the variability of system requirements, project timelines, the expertise of the development team, client specifications, and the programming languages involved.

A Waterfall model development methodology (Alazzawi et al., 2023) was chosen for this study which been accepted by software development teams worldwide. Waterfall development methodology differs from other development models such as agile because agile development model works by trying to fully understand and describe the application in written documents before code development commences.

In the waterfall development methodology, implementation of the requirements/design phase is done to produce functional requirements that will explain he application. This will be followed by a detailed user interface specification and design. Only when these documents are signed by the end user and the development team that the development commence. There has been a great success with large projects developed using the waterfall methodology.



Waterfall Development Methodology

Justification For Choosing Waterfall Development Methodology

In waterfall model, every stage must be fully completed before the commencement of the subsequence phase. At the end of every phase, review takes place to asses if the development is on the right track and if to continue or stop the project. By using this model, testing starts only after the development process is complete. Waterfall model does not allow phases to overlap hence reducing the rate of system development. Design errors are also captured before the development commences saving time during the implementation phase. Waterfall development methodology also emphasizes on technical documentation as a part of deliverables, this makes it easier for new programmers to easily understand the system during its maintenance phase.

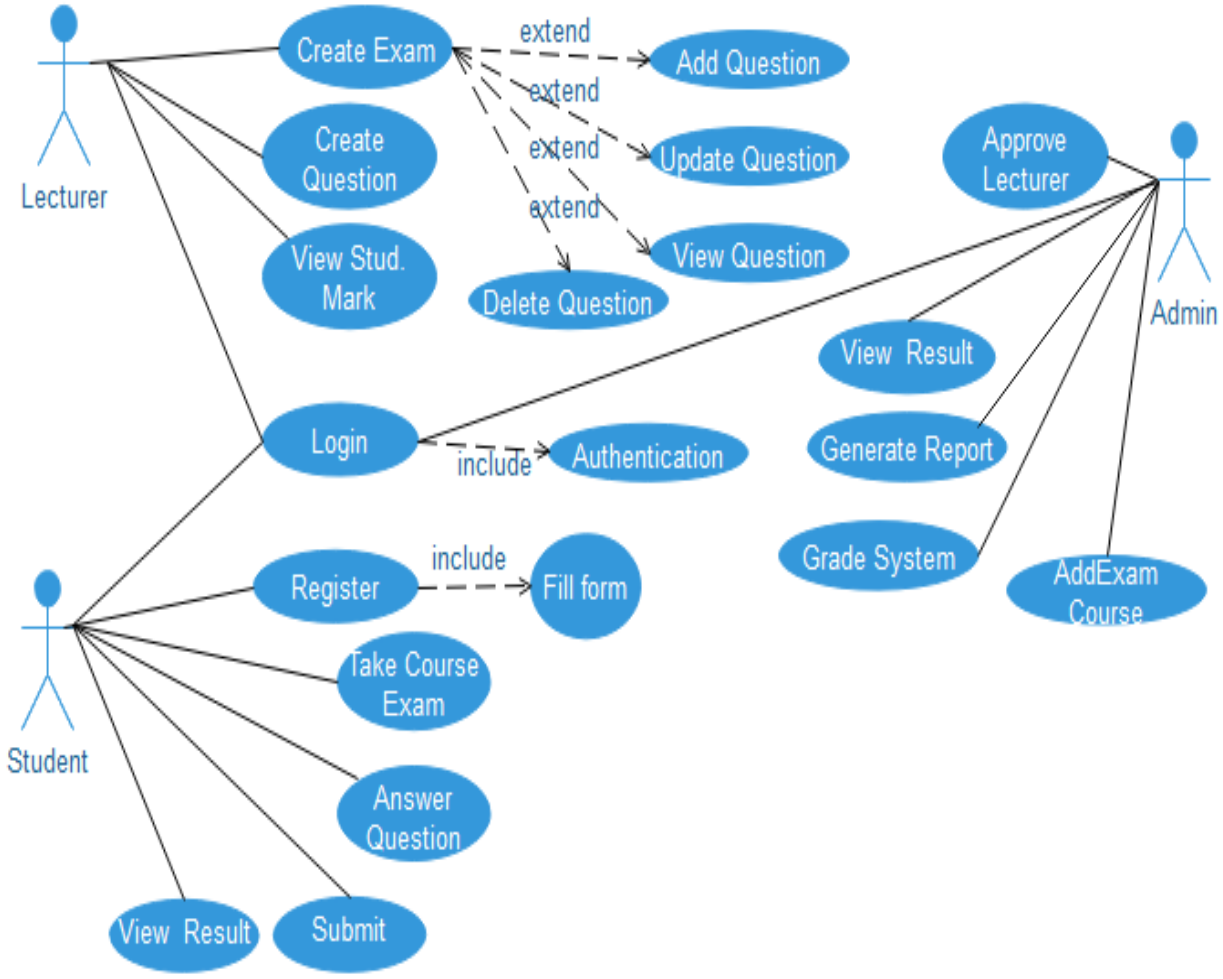
The methodology development approach is object oriented structured and it is easier to measure progress by reference to clearly defined deliverables. Total cost of a project can further be determined after the requirements are established. The methodology also makes testing easier as the testing can be done by referring to the functionalities defined in the functional specification.

Proposed Examination System

Examinations are part of daily academic programs administered by academics to test the understanding of students over modules taught to them. Administering examinations come with so many responsibilities in terms of time management, student management and deciding on the nature of exam to administer. The propose system is meant to solve all the mentioned problems. The system will allow for lectures to create courses, create questions, set the timing and date for a exam. Students on the other hand can be able to enroll for courses created by lecturers, take exams within allotted time and date and view their marks at the end of the exam. After the exam, the lecturer can be able to view student marks and print it for further processing.

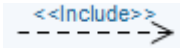
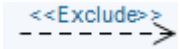
The proposed online examination system's design is based on a clear specification of system requirements, including detailed software components and their interdependencies. Unified Modeling Language (UML) is employed to illustrate the system's functional parts, which not only enhances the clarity of each component's role but also aids developers by simplifying the system's design and ensuring that it meets all required quality and functionality standards. This systematic approach provides a robust framework that aligns the architecture of the system with specific requirements, establishing a foundation for efficient development and implementation of a high-quality online examination system.

Use Case Diagram for the Proposed Cloud-Based Examination System: An Overview of User Interactions and System Functions

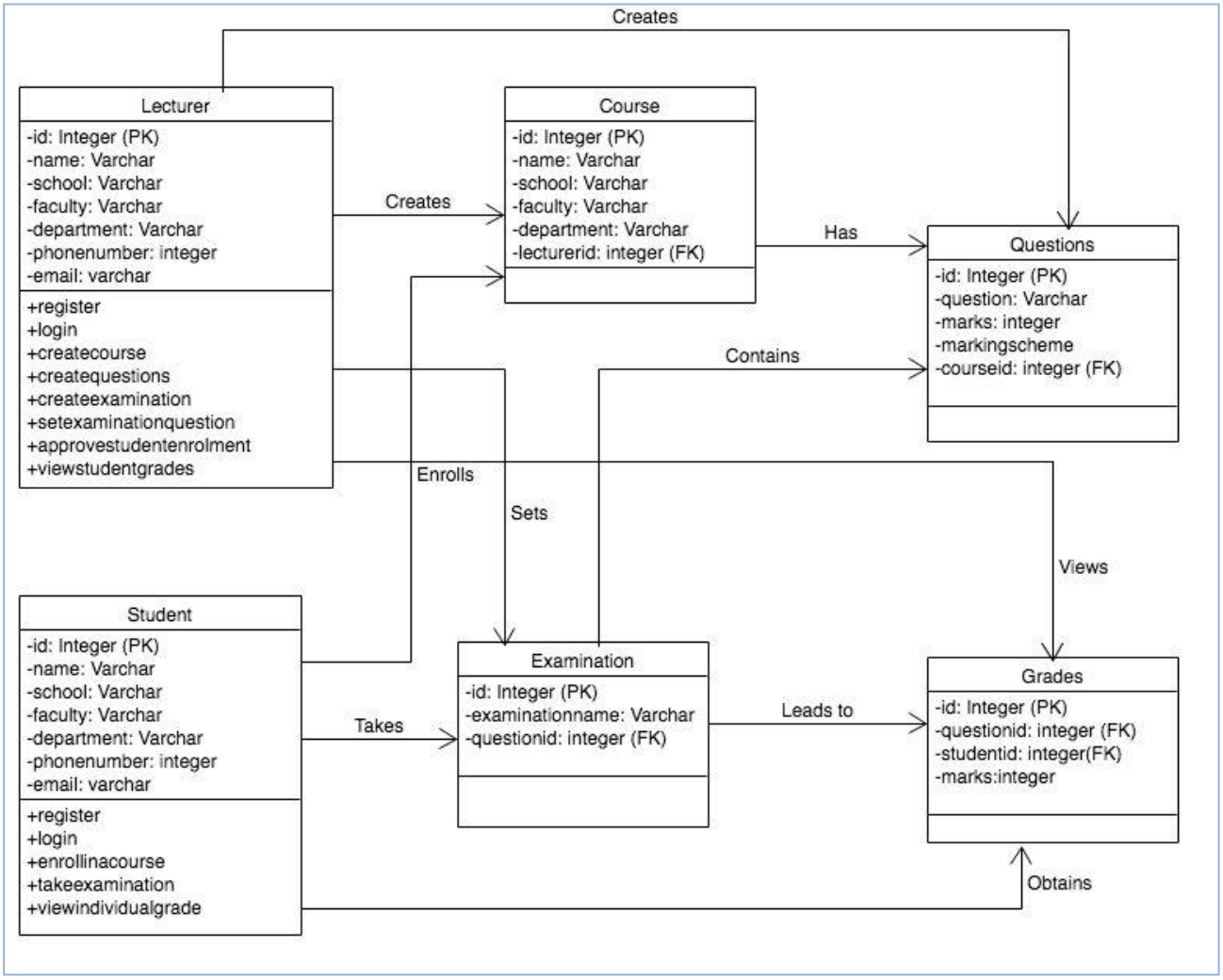


Use Case diagram of proposed system

Use case diagram description

Elements	Description
Actor 	Modeling users of the system. It can be human, other computer system or external device as shown in above Use Case diagram
	Unit of an externally visible operation.
	Identifying compulsory action within Use case
	identifying an alternative action within Use Case
	Identifying communication between actor and use case

Class diagram of proposed system



Class diagram description

Elements	Description
———	Indicate communication between classes.
———▷	It shows generalization between classes.
+ and -	The sign are used for attribute and function, + sign indicated that they are public while – sign indicated that they are private.

Class diagram of proposed system

Conclusions and Recommendations

An important development in the educational field is the use of cloud computing technologies to address the issues with online exam systems. Using cloud-based exams in educational institutions has many advantages, such as better marking control, data access that is not dependent on location, more adaptability, scalable solutions, and software updates that happen automatically. These systems also have the ability to automatically generate markings and lower overall costs. Since well-formatted software generates results, the possibility of manipulation is reduced.

Moreover, cloud computing maximises processor usage and transactional capacity during concurrent exam durations, enabling resources to be scaled down when the exams are finished, hence optimising resource utilisation during examination processes. Strong security measures like encryption, access controls, and frequent security audits can be implemented by educational institutions to further improve both the integrity and security of examination processes.

However, recognizing potential obstacles to this shift, such as problems with internet connectivity and data privacy, is essential. Even while cloud-based platforms have many benefits, some hands-on learning courses could still need traditional paper-and-pencil tests to evaluate practical skills. Institutions must make investments in reliable facilities and set up thorough security procedures in order to fully benefit from cloud-based examination. They can significantly improve the effectiveness and safety of their examination procedures by doing this, which will eventually help teachers as well as students.

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Utilization Of Academic Learning Management System To Enhancing Teaching And Learning In Federal Colleges Of Education In Northwest Zone Of Nigeria

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The study Assessed the Utilization of Academic Learning Management System in enhancing Teaching and Learning in Federal Colleges of Education in North West Zone, Nigeria. The study had two objectives. In line with the objectives, two research questions and two hypotheses were formulated and tested. The study adopted survey research design with population of 5,995 (five thousand, nine hundred and ninety-five) respondents which comprised 3,625 (three thousand six hundred and twenty-five) lecturers, and 2,370 (two thousand three hundred and seventy) senior. A sample size of three hundred and sixty-five (365) participants, consisting of two hundred and twenty-one lecturers (221) and one hundred and forty-four (144) senior management staff were used in the study. Data was collected through a self-structured questionnaire tagged "Utilization of Academic Learning Management System Questionnaire (UALMSQ)". The result of the pilot study conducted showed a reliability value of 0.82. Data collected in the study was analysed using descriptive statistics while Chi-square statistical method was used to test the null hypotheses at 0.05 level of significance. The findings of the study among others revealed that the Utilization of Academic Learning Management System for Course Management is poor in Federal Colleges of Education in North West Zone, Nigeria. Based on the findings of the study, it was recommended among others that: Colleges of Education staff across board should be trained on the effective use and application of Academic Learning Management System tools in consonance with the goals and objectives of the education system through strategic adherence to innovation.

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Introduction

Technology has changed society in the 21st century as much as the industrial revolution changed society in the eighteenth and nineteenth centuries. The evolution of education has been significantly influenced by technological advancements, leading to the rise of online and remote learning as transformative modalities. The history of online and remote learning dates back over a century, with correspondence courses and radio broadcasts playing a role in the 20th century (Olan, F., Arakpogun, E. O., Jayawickrama, U., Suklan, J., & Liu, S. 2022). Technological advancements such as internet connectivity, multimedia content, digital devices, Learning

Management Systems (LMS), and Artificial Intelligence (AI) have driven the shift, making learning more accessible to millions worldwide (Olan et al., 2022).

Higher institutions around the world have increasingly adopted technology and the internet as tools for teaching, curriculum development, staff development, and student learning (Usluel in Okeke, G. C. 2021). They are extensively using technology and the internet to develop alternative options for delivering courses to students, a task that entails guaranteeing the effective use of technologies in facilitating communication and activities that support education (Al-Khalifa, H. S. , 2010). Employing such innovations ensures that the learning process continues to move forward, regardless of where or when it occurs. Given that the internet is an excellent information source, educators can use specific web-based applications, such as academic learning management systems (ALMS), as teaching resources.

These applications, which are often termed e-learning platforms, enable lecturers to provide students with different materials and to interact with them in real time even when they are not located in the same physical space. This platform also allows lecturers to track the evolution of the learning process and monitor student performance on specific tasks (Martín-Blas & Serrano-Fernández, 2009). In recent years, education institutions around the world have become increasingly interested in digital learning to meet the growing student population, provide a broad and fast information base, and open up other areas of communication between students and teachers and among students themselves, on the other hand, through the use of technology (Khaddash & Al-Hadhrami, 2006).

Colleges of Education in Nigeria seem not to have seamlessly integrated Academic Learning Management Systems (ALMS) to enhance teaching and learning. ALMS, in its optimal utilization, offers a dynamic platform for collaborative learning, efficient course management, and objective assessment (Okeke, G. C. 2021). However, the current situation presents a stark contrast. Despite the global momentum toward digital education, there exists a significant gap in the awareness, availability, and utilization of ALMS in Nigerian Colleges of Education especially in the North West Zone, Nigeria.

Similarly, Ajemba, H. E., Ahmed, F. M., Ogunode, N. J., & OlatundeAiyedun, T. G. (2021) stated that the quality of education a student receives largely depends on the availability of quality digital learning resources provided, thus, in the recent times, students learn fast when digital tools are incorporated in the implementation of the teaching. The availability and utilization of ALMS are crucial in today's teacher education (Matazu, S. S., 2022). Over time, measures have been initiated to address this issue, including national policies advocating for technology integration in education. However, the persistence of the problem suggests that these efforts have not translated into widespread awareness, utilization and adoption at the grassroots level. The challenge according to Yamani and Elsigini (2021) is not merely technological but extends to issues of awareness among educators, inadequate infrastructure, and varying levels of digital literacy.

The consequences of this underutilization are profound. Colleges of Education continue to grapple with inefficient course management, limited opportunities for interactive learning, and a reliance on

traditional assessment methods. The gap between the ideal and the current state hinders the realization of the full potential of technology in education, impacting the quality of teacher training and, consequently, the overall educational system.

The mode of learning in educational sector is changing, given that the growth of technology has dramatically reshaped the teaching and learning processes. Technology integration has become an essential part of learning and teaching, and most especially, digital learning has become a key factor in the teaching field (Alkhalaf et al., 2012). The integration of ICT in teaching has opened new horizons for teachers to have more interactive and learner-centered classroom environment. Academic learning management systems (ALMS) are computer programmes that integrate functions for teaching, evaluation and administration of courses. ALMS have many features which include sharing of documents, discussion board, assessments, grade book and chat room. ALMS is increasing in higher education especially in developed countries, but many lecturers in developing countries like Nigeria, especially in North Western Zone, Nigeria state use only the parts or functions that replace older techniques for reproducing and distributing documents.

This research is prompted by the urgent need to bridge this gap and address the persistent challenges in the awareness and utilization of ALMS. The existing literature lacks a comprehensive understanding of the specific factors hindering the effective integration of ALMS in Nigerian Colleges of Education. By identifying and addressing these factors, the research aims to contribute not only to the academic discourse on educational technology but also to the practical improvement of teaching and learning in Nigeria's teacher training institutions.

Assessment has a rich history dating back to ancient civilizations. The Chinese civil service exams, initiated during the Han Dynasty, are among the earliest examples of formalized assessments. In the Western world, assessment practices have evolved from oral exams in Ancient Greece to written examinations in medieval universities. The assessment landscape has witnessed significant shifts, reflecting changes in educational philosophy and pedagogy. Bloom (1956), a renowned educational psychologist, introduced Bloom's Taxonomy, a hierarchical framework classifying educational objectives. Assessment, according to Bloom, serves to evaluate cognitive skills ranging from simple recall to complex synthesis and evaluation

Marzano (2006), an educational researcher, emphasizes the formative aspect of assessment in his work. Assessment, according to Marzano, should be an integral part of the teaching and learning process, providing ongoing feedback to both educators and students. Wiggins (1993), an influential educational theorist, emphasizes the role of assessment in promoting understanding. He introduced the concept of "backwards design," where assessment is an integral part of the curriculum development process, ensuring alignment with learning objectives. Black and Wiliam (1998), in their seminal work on formative assessment, highlight the importance of ongoing, classroom-based assessments in improving learning outcomes. They argue that assessment should not only measure but also enhance learning. Stiggins (2002), a prominent figure in assessment for learning, defines assessment as "the process of gathering evidence of student learning to inform instructional decisions."

The concept of utilization, within the broader context of knowledge and information, has roots in early philosophical and scientific inquiries. Ancient scholars, such as Aristotle and Plato, emphasized the practical application of knowledge for societal benefit. Over time, this notion has evolved, gaining prominence in various fields, including education, management, and research. Frost (2007), a scholar in the field of organizational behaviour, defined utilization as the integration of knowledge into organizational practices. He highlighted the dynamic nature of utilization, emphasizing that it involves ongoing processes of knowledge application and adaptation (Frost, 2007).

In contemporary discussions, the concept of utilization has expanded beyond traditional research settings to encompass diverse fields, including technology, policy-making, and business. It now includes not only the direct application of knowledge but also the effective communication, dissemination, and adaptation of information to address practical challenges. The concept of utilization has a rich history, deeply rooted in the practical application of knowledge. Scholars from various disciplines have contributed nuanced perspectives, emphasizing the dynamic and multifaceted nature of utilization. From early philosophical inquiries to contemporary organizational practices, the concept continues to evolve, reflecting changing paradigms and approaches in utilizing knowledge for informed decision-making.

The Learning Management System (LMS) is a software which is managing the learning process that is created in different types of platforms, either can be used in traditional IT or cloud-based are called “Learning Management System” (LMS). There are many types of LMS some are used to keep and maintain learning process, like web portals that assemble different links in the web and offer them to a learner, it may also view video files library to assist learner achieve their search (Kaewkiriya & Utakrit, 2012). LMSs are known by various names such as course management system (CMS), learning content management system (LCMS), virtual learning environment (VLE), and virtual learning system (VLS) (Wright et al., 2014). The Learning Management System is the backbone of e-learning which provides the essential components required for hosting of the e-learning contents. The Learning Management System is a software application which is used to automate the administration, tracking and reporting the education and training activities. According to Wright et al. (2014), learning management system is software that is use in learning content presentation which has a significant role and complexity in e-learning environment. Dobre (2015), defined LMS as a software (web) application used to plan, implement, and assess learning processes. An LMS provides instructors with a way to create and deliver content, monitor learner participation, and assess performance. E-Learning is now becoming the primary delivery mode of the education in higher education sector.

According to Angelova et al. (2015), LMSs are web-based tools for conducting quality online teaching and training. They are platforms for interaction with educational content that is created and presented in a suitable format. LMSs are software applications meant for the tracking, administration, reporting, documentation and delivery of educational contents. They help lecturers deliver instructional content to students, and also help to administer tests and assignments, track student progress, and manage the classroom situation. The course related activity such as lecture, online

assignments, discussion and quizzes are available to the students through this system. It provides common platform to both teacher and student for online learning and training (Prabha & Sanjeev, 2015).

There are several types of Learning Management Systems (LMS), each tailored to specific needs and contexts. Here are some common types and their key features:

Academic LMS

An Academic Learning Management System (LMS) is specifically designed to meet the needs of educational institutions such as schools, colleges, and universities. Here's more information about Academic LMS: Academic LMS allows educators to create, organize, and manage courses, including syllabi, lesson plans, and course materials. Students can enroll in courses, and administrators can manage enrollment and registration processes. Academic LMS includes gradebook functionality for instructors to record and track student performance. Supports various assessment methods, including quizzes, assignments, and exams. Provides communication features like discussion boards, email integration, and chat to facilitate teacher-student and student-student interactions. Supports the delivery of various types of educational content, including text, multimedia, and interactive resources

- Designed for schools, colleges, and universities.
- Features like gradebook management, course enrolment, and support for academic content.
- Supports traditional classroom settings and online learning.

Corporate LMS

A corporate learning management system (LMS) is a specialized software platform designed to facilitate employee training and development within organizations. It supports the onboarding process by providing training modules and resources for new hires. Offers ongoing training opportunities for employees to enhance their skills. Helps organizations track and ensure compliance with industry regulations and internal policies.

- Geared towards employee training and development.
- Features include compliance tracking, employee progress monitoring, and integration with HR systems.
- Supports onboarding, compliance training, and skill development.

Open Source LMS

An Open-Source Learning Management System (LMS) is a type of LMS software that is freely available for anyone to use, modify, and distribute. Open Source LMS software is typically distributed under open-source licenses (e.g., GNU GPL), which means it can be used, modified, and distributed by anyone without licensing fees. Users have the freedom to customize and adapt the software to suit their specific needs. This includes adding new features, modifying the user interface, or integrating with other systems. Open source projects often have active communities of developers, users, and contributors who provide support, documentation, and updates. This can lead to a robust ecosystem of plugins and extensions.

- Free and customizable LMS software.
- Allows organizations to modify and adapt the system to their specific needs.
- Examples include Moodle and Sakai.

Cloud-Based LMS

- Hosted on external servers, eliminating the need for on-premises hardware.
- Scalable and accessible from anywhere with an internet connection.
- Often more cost-effective for smaller organizations.

Mobile Learning (m-Learning) LMS

- Optimized for mobile devices.
- Enables learning on smartphones and tablets.
- Supports responsive design and mobile-friendly content.

Social Learning LMS:

- Integrates social features like discussion forums, chat, and collaboration tools.
- Encourages learner interaction and peer-to-peer learning.
- Fosters a sense of community among learners.

Blended Learning LMS

- Supports a combination of in-person and online learning.
- Enables the integration of traditional classroom instruction with digital resources.
- Ideal for hybrid or flipped classroom models.

e-Commerce LMS

- Geared towards selling online courses and training programs.
- Includes features for course catalog, payment processing, and user registration.
- Often used by training companies and entrepreneurs.

Gamified LMS

- Incorporates gamification elements to enhance engagement.
- Uses game-like features such as badges, leaderboards, and points to motivate learners.
- Can make learning more enjoyable and interactive.

Analytics and Reporting LMS:

- Offers robust analytics and reporting tools.
- Allows administrators to track learner progress, assess the effectiveness of courses, and make data-driven decisions.

Note: The features of an LMS can vary widely depending on the type and specific needs of the organization or educational institution. When choosing an LMS, it's essential to consider the features that align with your goals and requirements.

Objectives of the Study

The specific objectives of this study are to:

1. determine the Utilization of Academic Learning Management System for Course Management in Federal Colleges of Education in North West Zone, Nigeria; and
2. ascertain the Utilization of Academic Learning Management System for Assessment in Federal Colleges of Education in North West Zone, Nigeria.

Research Questions

The following research questions are raised to guide the study.

1. How has Academic Learning Management System been utilized for Course Management in Federal Colleges of Education in North West Zone, Nigeria?
2. To what extent has Academic Learning Management System been utilized for Assessment in Federal Colleges of Education in North West Zone, Nigeria?

Research Hypotheses

The following hypotheses were formulated and tested at 0.05 level of significance:

H_{o1}: There is no significant difference in the opinions of respondents on the Utilization of Academic Learning Management System for Course Management in Federal Colleges of Education in North West Zone, Nigeria;

H_{o2}: There is no significant difference in the opinions of respondents on the Utilization of Academic Learning Management System for Assessment in Federal Colleges of Education in North West Zone, Nigeria

Methodology

The study adopted survey research design because the respondents are scattered in different parts of North West Zone, Nigeria with one or more characteristics in common. The population of 5,995 (five thousand, nine hundred and ninety-five) respondents which comprised 3,625 (three thousand six hundred and twenty-five) lecturers, and 2,370 (two thousand three hundred and seventy) senior was used. A sample size of three hundred and sixty-five (365) participants, consisting of two hundred and twenty one lecturers (221) and one hundred and forty-four (144) senior management staff were used in the study. The samples were randomly sampled using the recommendation of Research Advisors (2006) sample size table (see appendix A). According to Research Advisors (2006) sample size table, for a population of 5,001 – 7,500, a sample size of 365 should be used. Data was collected through a self-structured questionnaire tagged "Awareness and Availability of Academic Learning Management System Questionnaire (AAALMSQ)". The face and content validity of the research instrument was determined by experts within the field of education. To ascertain the reliability of the instrument, a pilot study with 20 lecturers and 10 senior management staff totalling 30 participants were used in Federal College of Education (Technical) Gusau. This is because the state is part of the study area but did not form part of the sampled institutions used in the main study. The result of the pilot test showed a reliability value of 0.82. Data collected in the study was analysed using descriptive statistics while Chi-square statistical method was used to test the null hypotheses at 0.05 level of significance.

Results

Research Question One: How has Academic Learning Management System been utilized for Course Management in Federal Colleges of Education in North West Zone, Nigeria?

Table 1: Utilization of Academic Learning Management System for Course Management in Federal Colleges of Education in North West Zone, Nigeria

SN	Statement	Respondents	SA	A	U	D	SD	Mean	SD	Remark
1.	The Academic Learning management System (LMS) is regularly used for course management in Colleges of Education.	Senior Mgt Staff	-	-	43	70	31	2.555	1.666	
		Lecturers	10	32	31	78	70	2.160	1.122	Negative
2.	Course materials and resources are effectively organized and accessible through the Academic LMS in Colleges of Education.	Senior Mgt Staff	-	-	31	74	39	3.000	0.100	
		Lecturers	-	13	-	138	70	2.827	1.196	Negative
3.	Assignments and assessments are efficiently administered via	Senior Mgt Staff	-	14	20	56	54	1.555	0.527	

	the Academic LMS in Colleges of Education.	Lecturers	-	1	10	140	70	3.052	1.123	Negative
4.	The Academic LMS facilitates effective communication between instructors and students in Colleges of Education.	Senior Mgt Staff	-	-	16	114	14	2.888	1.269	
		Lecturers	-	28	1	132	60	2.377	1.114	Negative
5.	Grades and feedback are easily accessible to students through the Academic LMS in Colleges of Education.	Senior Mgt Staff	-	-	30	106	8	2.277	1.715	
		Lecturers	-	-	29	132	60	2.172	1.170	Negative
6.	The Academic LMS supports collaborative learning activities among students in Colleges of Education.	Senior Mgt Staff	-	14	16	106	8	2.666	1.414	
		Lecturers	-	-	68	92	61	2.974	1.088	Negative
7.	Instructors actively use features like discussion forums and quizzes in the Academic LMS in Colleges of Education.	Senior Mgt Staff	-	8	22	94	20	2.888	1.269	
		Lecturers	-	1	51	108	61	2.172	0.971	Negative
8.	The Academic LMS allows for the integration of multimedia elements in course content in Colleges of Education.	Senior Mgt Staff	8	9	43	76	8	2.888	1.054	
		Lecturers	1	-	41	68	111	2.477	0.937	Negative
9.	Students find the Academic LMS user-friendly and beneficial for their learning in Colleges of Education.	Senior Mgt Staff	29	9	48	42	16	2.444	1.509	
		Lecturers	-	1	42	98	80	2.584	0.979	Negative
10	The utilization of the Academic LMS enhances the quality of course management in Colleges of Education.	Senior Mgt Staff	31	-	31	37	38	1.888	1.269	
		Lecturers	-	1	40	98	82	2.717	1.176	Negative
						Response Mean	=	*2.82*	*1.12*	

Table 1, revealed that the responses of the two categories of respondents from item 1-10 were in negative response, it can then be concluded that, the Academic Learning Management System has not been utilized for Course Management in Federal Colleges of Education in North West Zone, Nigeria. This can be seen on the table which presents the average response mean of 2.82 which is lower than the rating mean of 3.0. Most of the items stated regarding this research question recorded a negative response means lower than the rating mean of 3.0, which indicated strong disagreement on the part of the participants. For instance, item number 10 on the table which revealed that the utilization of the Academic LMS enhances the quality of course management in Colleges of Education. The item recorded the response means of 1.888, and 2.717 by the senior management staff, and lecturers respectively. Details showed that 31 senior management staff agreed with the item, 31 respondents undecided and 82 disagreed. Similarly, 1 lecturer strongly agreed with the item, 180 disagreed, 40 were undecided, with the item. By implication, this result implies that Academic Learning Management System has not been utilized for Course Management in Federal Colleges of Education in North West Zone, Nigeria.

Research Question Two: To what extent has Academic Learning Management System been utilized for Assessment in Federal Colleges of Education in North West Zone, Nigeria?

Table 2: Utilization of Academic Learning Management System for Assessment in Federal Colleges of Education in North West Zone, Nigeria

SN	Statement	Respondents	SA	A	U	D	SD	Mean	SD	Remark
1.	Examination assessments are regularly conducted through the Academic LMS in Colleges of Education.	Senior Mgt Staff	23	31	26	19	45	2.555	0.726	
		Lecturers	1	43	71	47	60	2.250	0.997	Negative
2.	The Academic LMS is effectively used for grading and providing feedback to students in Colleges of Education.	Senior Mgt Staff	22	3	38	27	54	2.111	1.269	
		Lecturers	-	27	51	103	40	2.102	1.184	Negative
3.	The Academic LMS allows for a variety of assessment methods (e.g., multiple choice, essays) in Colleges of Education.	Senior Mgt Staff	14	-	40	36	54	2.444	0.881	
		Lecturers	-	-	1	152	41	2.605	1.173	Negative
4.	The Academic LMS supports secure and reliable online assessment processes in Colleges of Education.	Senior Mgt Staff	-	-	25	70	49	2.777	0.440	
		Lecturers	-	1	10	209	1	2.014	1.322	Negative
5.	Instructors are comfortable using the Academic LMS for both formative and summative assessments in Colleges of Education.	Senior Mgt Staff	-	-	12	107	25	2.341	0.123	
		Lecturers	-	-	1	142	78	2.773	1.253	Negative
6.	The Academic LMS facilitates the timely release of assessment results to students in Colleges of Education.	Senior Mgt Staff	-	-	-	112	32	1.200	0.322	
		Lecturers	-	-	1	112	108	2.296	0.215	Negative
7.	There is proper training and support for instructors on the use of Academic LMS for assessments in Colleges of Education.	Senior Mgt Staff	-	-	-	107	37	2.000	1.581	
		Lecturers	-	-	-	113	108	1.965	1.305	Negative
8.	Students have access to their assessment results and feedback through the Academic LMS in Colleges of Education.	Senior Mgt Staff	-	-	-	127	17	2.711	1.536	
		Lecturers	-	-	1	112	108	2.069	1.219	Negative
9.	The Academic LMS is perceived as a reliable platform for conducting fair assessments in Colleges of Education.	Senior Mgt Staff	-	-	-	98	48	2.888	1.536	
		Lecturers	-	30	31	81	79	2.244	1.097	Negative
10	The level of utilization of the Academic LMS for assessment is satisfactory in Colleges of Education.	Senior Mgt Staff	-	-	3	95	46	2.333	1.414	
		Lecturers	-	60	40	32	89	2.011	1.151	Negative
							Response Mean	=	*2.36*	*1.03*	

Lastly, in Table 2, majority of the responses of the two categories of respondents from item 1-10 were in negative response, it can then be concluded that, the extent to which Academic Learning Management System has been utilized for Assessment in Federal Colleges of Education in North West Zone, Nigeria is low. This can be seen on the table which presents the average response mean of 2.36 which is lower than the rating means of 3.0. Most of the items stated regarding this research question recorded a negative response means lower than the rating mean of 3.0, which indicated strong disagreement on the part of the participants. For instance, item number 2 on the table which revealed that the Academic LMS is effectively used for grading and providing feedback to students in Colleges of Education. The item recorded the response means of 2.111, and 2.102 by the senior management staff, and lecturers respectively. Details showed that 25 senior management staff agreed with the item, 38 respondents undecided and 81 disagreed. Similarly, 27 lecturers strongly agreed with the item, 143 disagreed, 51 were undecided, with the item. By implication, this result implies that Academic Learning Management System has not been utilized for Assessment in Federal Colleges of Education in North West Zone, Nigeria.

Hypothesis One: There is no significant difference in the opinions of respondents on the Utilization of Academic Learning Management System for Course Management in Federal Colleges of Education in North West Zone, Nigeria.

The opinions of senior management staff and lecturers on the Utilization of Academic Learning Management System for Course Management in Federal Colleges of Education in North West Zone, Nigeria are analysed using chi-square (χ^2). The summary of the hypothesis tested is presented in table 3:

Table 3: Summary of Chi-square test on the Utilization of Academic Learning Management System for Course Management in Federal Colleges of Education in North West Zone, Nigeria

Number	χ^2 cal.	χ^2 crit.	α	df	P-value	Decision
365	39.452	18.27	0.05	96	0.451	Retained

Table 3 revealed that the χ^2 cal. (39.452) is greater than the χ^2 crit. (18.27) at 96 degrees of freedom and at 0.05 level of significance. This result therefore means that there is significant difference in the opinions of senior management staff and lecturers on the Utilization of Academic Learning Management System for Course Management in Federal Colleges of Education in North West Zone, Nigeria. The implication of this result is to retain the hypothesis which says that there is no significant difference in the opinions of senior management staff and lecturers on the Utilization of Academic Learning Management System for Course Management in Federal Colleges of Education in North West Zone, Nigeria.

Hypothesis Two: There is no significant difference in the opinions of respondents on the Utilization of Academic Learning Management System for Assessment in Federal Colleges of Education in North West Zone, Nigeria.

The opinions of senior management staff and lecturers on the Utilization of Academic Learning Management System for Assessment in Federal Colleges of Education in North West Zone, Nigeria are analysed using chi-square (χ^2). The summary of the hypothesis tested is presented in table 4:

Table 4: Summary of Chi-square test on the Utilization of Academic Learning Management System for Assessment in Federal Colleges of Education in North West Zone, Nigeria

Number	χ^2 cal.	χ^2 crit.	α	df	P-value	Decision
365	104.67	18.27	0.05	27	0.147	Retained

Table 4 revealed that the χ^2 cal. (104.67) is greater than the χ^2 crit. (18.27) at 54 degrees of freedom and at 0.05 level of significance. This result therefore means that there is no significant difference in the opinions of senior management staff and lecturers on the Utilization of Academic Learning Management System for Assessment in Federal Colleges of Education in North West Zone, Nigeria. The implication of this result is to retain the hypothesis which says that there is no significant difference in the opinions of senior management staff and lecturers on the Utilization of Academic Learning Management System for Assessment in Federal Colleges of Education in North West Zone, Nigeria.

Summary of Findings

In view of the research questions answered and hypotheses tested in the study, findings emerged that.

1. In opinions of senior management staff and lecturers, the Utilization of Academic Learning Management System for Course Management is poor in Federal Colleges of Education in North West Zone, Nigeria. On the test of hypothesis, no significant difference was observed in the response of the participants (p-value .451 > 0.05 alpha level).
2. In opinions of senior management staff and lecturers, the Utilization of Academic Learning Management System for Assessment is poor in Federal Colleges of Education in North West Zone, Nigeria. On the test of hypothesis, no significant difference was observed in the response of the participants (p-value .147 > 0.05 alpha level).

Discussions

Findings of the study also revealed that there is significant difference in the opinions of senior management staff and lecturers on the Utilization of Academic Learning Management System for Course Management in Federal Colleges of Education in North West Zone, Nigeria. As a result, hypothesis three which says that there was no significant relationship in the opinions of senior management staff and lecturers on the Utilization of Academic Learning Management System for Course Management in Federal Colleges of Education in North West Zone, Nigeria was retained. This connote that the hypothesis was not statistically significant and by Utilization of Academic Learning Management System for Course Management in Federal Colleges of Education in North West Zone, Nigeria is very low. This result is in agreement with the findings of Young (2016) which showed that, increasing knowledge sharing and innovation practices provides for positive social change for the personnel of these organisations, since the skills they learn within their organisations are immediately usable in their personal endeavours and are transferrable to those they interact with outside of their organizations. The finding contradicts the finding of Biljon and Renaud (2017) discovered that given the innate human ability to understand and remember visual representations, the considered inclusion of visualisations support objectivity, consistency and fairness in assessment. It also help students to engage in more depth with the subject matter, reaching a profounder

understanding thereof, in the process of producing the visualisations. In practice this means that supervisors should consider instructing candidates to include specific standard visualisations such as a chapter map, a literature overview diagram and a visualisation of their conceptual framework.

Lastly, findings showed that there is no significant difference in the opinions of senior management staff and lecturers on the Utilization of Academic Learning Management System for Assessment in Federal Colleges of Education in North West Zone, Nigeria. As a result, hypothesis two which says that there was no significant difference in the opinions of senior management staff and lecturers on the Utilization of Academic Learning Management System for Assessment in Federal Colleges of Education in North West Zone, Nigeria was retained. This connote that the hypothesis was statistically not significant and by implication the Utilization of Academic Learning Management System for Assessment in Federal Colleges of Education in North West Zone, Nigeria is poor. This result is in agreement with the findings of Usman, Uchendu et al., Ohiorenoya and Eboreime. Usman finding showed that both knowledge acquisition and knowledge sharing has significant impact on performance of deposit money banks. The finding is also in agreement with Uchendu et al. who found a significant relationship between knowledge sharing, knowledge mapping, and lecturers' job performance. Ohiorenoya and Eboreime found a high positive correlation between knowledge management and performance in Nigerian universities.

Conclusion

Based on the findings it can be concluded that the awareness of Academic Learning Management System in Federal Colleges of Education in North West Zone, Nigeria is so high but has not been sufficiently utilized. However, in consistent with the literature, the availability of Academic Learning Management System Infrastructure is very low in Federal Colleges of Education in North West Zone, Nigeria. The finding also pointed out that the Utilization of Academic Learning Management System for Course Management is poor in Federal Colleges of Education in North West Zone, Nigeria. Also, the finding confirmed that the Utilization of Academic Learning Management System for Assessment is poor in Federal Colleges of Education in North West Zone, Nigeria.

Recommendations

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

1. Institutions that want to keep their academic operations relevant and smooth should incorporate Academic Learning Management System into their management strategy. This will improve college management output and help to reposition colleges in the region.
2. Federal Government through the National Commission for Colleges of Education should budget appropriately for the provision of Academic Learning Management System infrastructure in the Federal Colleges of Education in the region. This will ensure the effective educational service delivery the Federal Colleges of Education.

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COMPARATIVE ANALYSIS OF THE EFFECTS OF ICT-BASED AND CONVENTIONAL TEACHING METHODS ON STUDENT-CENTERED LEARNING AMONG UNDERGRADUATE STUDENTS AFFILIATED WITH FCE, ZARIA, KADUNA STATE – NIGERIA

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The study compares the effects of Information and Communication Technology (ICT) and conventional teaching methods on student-centered learning approaches among undergraduate students at FCE Zaria in Kaduna State, Nigeria. The study used a pre-test post-test experiment and control group design, with 60 400-level B.Sc. Economics students from FCE Zaria. The students were divided into two groups, the experimental group (EG) and the control group (CG). The Econometric Achievement Test (EAT) was used to measure academic performance. The results showed a significant difference in academic performance between the two groups. However, there was no discernible difference in retention rates between the two groups. The study recommends using ICT as an instructional strategy in econometrics teaching to limit instructor-based domination and encourage group work.

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Introduction

The use of information and communication technology (ICT) has increased significantly in recent decades, and student-centred learning (SCL) has become more of a focus in higher education globally. To better educate students for the workplace of the twenty-first century, techniques based on SCL and ICT are being introduced. Teachers continued to use traditional teaching methods despite the early 2000s curriculum overhaul that included the introduction of ICT and SCL, with ICT playing a secondary role in teaching and learning.

It is common practice to employ information and communication technology (ICT) as a tool to assist contemporary pedagogies, particularly student-centred learning (SCL) pedagogy. In the modern workforce, where job-related competencies and more general skills are valued, this modern pedagogical method is a successful teaching tool. Higher education institutions (HEIs) must thus embrace SCL to lay the groundwork for graduates' continuous development of competence, skills, and knowledge (Janor et al., 2013; Muganga, 2015).

A new stage in the adoption of ICT was thought to have begun with the emergence of the Internet and the provision of courses on fundamental computer skills for educators,

learners, and civil personnel in general. Additionally, during this time, the higher education institution started providing email access to academic personnel and non-academic workers as well as acting as an Internet provider for public institutions. Along with curriculum reform in the 2000s, the university installed computer rooms in certain faculties and encouraged teaching and learning with them. The transition from an industrial society to an information and knowledge society was seen as a global development, and many countries in the world were preparing their economies and societies for this new era (Hadad, 2017).

The curriculum reform process introduced SCL and ICT as tools for teaching and learning, and there was also a need to provide teachers with the skills and abilities necessary to introduce the changes and pedagogical practices necessary for this new reality. This study investigates the comparative analysis of the impact of ICT and conventional teaching methods on Students' student-centred learning approach among undergraduate studies affiliated with FCE Zaria in Kaduna State – Nigeria. This shift in focus in higher education was brought about by the recognition of the value of ICTs and the role that student-centred education played in implementing these changes (MINED, 2011).

Statement of the Problem

In the classroom teaching and learning process, the use of ICT is imperative as it gives chance to the instructors and learners to operate, store, control and retrieve data other than to promote self-regulated and active learning. ICT-based learning includes an expanded propensity towards collaborative learning among learners and instructors, not just in a specific classroom. This kind of collaboration is in contrast to the conventional learning environment.

Understanding how to use ICT is essential when considering the future of education. Instructors who do not use new technology for teaching create opportunities for these tools to behave in ways that are not optimal. ICT will inevitably be used in education, thus it's critical to recognize trends that could lead to improved teaching and learning environments down the road. There was little discernible change in the use of ICT for teaching and learning, and instructors persisted in employing antiquated and traditional pedagogical techniques in their instruction despite efforts to switch to SCL. This study is distinctive in that it investigates the effects of ICT-based and conventional teaching methods on student-centred learning of undergraduate students of the Department of Economics, Federal College of Education Zaria affiliated with Usmanu Danfodiyo University, Sokoto.

Objective of the Study

The study aimed at achieving the following objective:

- To determine the mean difference in academic achievement of control and experimental groups on pretest.
- To examine the mean difference in the academic performance of students who were taught while using ICT and the academic performance of students who were taught through conventional teaching methods on post-test.
- To identify the mean difference in retention of students who were taught using ICT and the retention of students taught using conventional teaching methods.

Research Question

The study intends to provide the answer to the following question:

- Is there a significant difference in the mean academic achievement scores of the control and experimental groups on the pretest?

- How does the mean academic achievement performance of students taught using ICT-based teaching methods compare with those taught using conventional methods on the post-test?
- Is there a significant difference in the mean retention scores of students taught using ICT-based teaching methods and the retention of students taught using conventional teaching methods?

Research Hypotheses

The following hypotheses were formulated and tested at 95% confidence level ($p \leq 0.05$).

- $H0_1$ = There is no significant difference in the mean academic achievement scores of the control group and experimental group on the pretest.
- $H0_2$ = There is no significant difference in the mean academic performance scores of students taught Using ICT-based teaching methods and those taught using conventional teaching methods on the post-test
- $H0_3$ = There is no significant difference in the mean retention scores of students taught using ICT-based teaching methods and those taught using conventional teaching methods.

The flexibility-activity framework

The flexibility-activity framework outlined by Collis and Moonen (2001) serves as the initial frame of reference for this investigation. This is a broad product that can be written, graphic, or both that describes the important ideas, variables, and presumptive relationships between them in the context of ICT use in higher education. Concerning the important aspects that are predetermined by the instructor or the organization for a particular teaching and learning scenario involving cutting-edge pedagogy and cutting-edge learning technology, this framework provides the student with a variety of possibilities. This framework is characterized by four key components of flexibility in the implementation of ICT-supported learning in higher education: these are technology, pedagogy, implementation strategy, and institution,

In Humbhi, Tareen, and Raheem's (2022) study, the effects of ICT resource availability on students' academic performance are examined, along with the usefulness of the technology and its influence on students' academic performance in higher education institutions located throughout Pakistan. 400 students were selected using an appropriate sample technique from the top six universities in Balochistan, one of the nation's largest regions. A closed-ended survey questionnaire including thirty-four items was utilized to gather data from the participants. The quantitative responses of the respondents have been gathered and analyzed using a quantitative research approach. Additionally, SPSS software was used to examine the relationships between the theories. The study's findings indicate that ICT significantly affects how well kids perform in the classroom. Students prefer to use ICT resources to do their academic assignments in the current era of technology. The findings also showed that the institutions' financial and material resources for ICT equipment are low. However, students continue to enable access to a variety of ICT apps within their educational institutions. The results of this study also emphasized Pakistan's higher education institutions' weak points in terms of ICT resource accessibility and availability. Who is preventing the students from using ICT tools to finish their coursework more quickly? The results of this study will help the Pakistani government, the Higher Education Commission (HEC), and educators recognize the value of ICT and ensure that students have

access to enough ICT-related resources for improved learning.

The study conducted by Hussain, Suleman, Naseeruddin, and Shafique (2017) looks at how information and communication technology affect students' retention and academic performance in chemistry. A random selection of fifty ninth-grade pupils was made from Kohsar Public School and College Latamber Karak. Based on their results on the pretest, the students were divided into similar groups. Pretest posttest equivalent groups design was utilized to gather data. Using SPSS, the independent samples t-test, mean, and standard deviation were used to analyze the data. Information and communication technology (ICT) was discovered to be more persuasive after statistical analysis revealed that it has a favourable impact on student's academic achievement and retention. Effective and valuable in teaching chemistry when contrasted with conventional techniques of teaching. It is recommended that information and communication technology should be used in teaching chemistry to enhance students' academic achievement at the secondary level.

In Chittagong, Bangladesh, Ullah, Alam, Shan-A-Alahi, Rahman, Masum, and Akter (2019) looked at how ICT affected students' academic performance at many private universities. Using a survey questionnaire, primary data were gathered from those universities' student populations. OLS regression, Confirmatory Factor Analysis, Descriptive Statistics, Dependability Analysis, Structured Equation Modelling (SEM) and data mining algorithms like Association rule mining and éclat have been used to assess how important each component is concerning determining the student's academic achievement. Overall results show a substantial correlation between students' academic achievement and ICT use from a statistical and mining perspective. Additionally, a student's addiction to ICT significantly affects how well they perform academically when measured comparatively. Lastly, the report suggests that classroom CT infrastructure be enhanced. Instructors ought to employ ICT in their lessons; technology ought to be utilized for personal growth and restrained from being too utilized. The majority of the time, students should utilize ICT for academic objectives. Every university should employ technology for educational purposes.

The study conducted by Ishaq, Afzal Ahah, Muqaddar, and Tufail (2021) examined the impact of information and communication technology (ICT) on university students' academic achievement and motivation. The study's goals were to learn about university-level students' perceptions of knowledge, skills, and ICT usage; to learn about students' motivation and academic success; and to ascertain whether male and female students' perceptions of these same topics differ. Additionally, to ascertain the impact of ICT on university-level student academic attainment and motivation. The study design employed was the descriptive survey. All undergraduate students enrolled in Hazara Division public universities make up the study's population. As a sample for the study, 300 students total—100 from each university—were included. The method of stratified simple random sampling was applied. There were two self-made surveys used. The tool's reliability was confirmed and enhanced using Cronbach Alpha on SPSS, indicating a 0.92 reliability value obtained through pilot testing with 50 students. Students enrolled in undergraduate programs provided the data. Subsequently, the information was input into Excel and analyzed using SPSS. The main findings showed that while ICT has a considerable impact on students' motivation, it

has little bearing on their academic performance. It is recommended that educational institutions should introduce ICT in such a way that promotes students.

Methodology

Research Design

The most suitable research design for this study is Quasi-experimental design, specifically a non-equivalent control group pretest-posttest design reason is that there is no random assignment of the participant to the control and experimental group.

Population of the Study

The population of this research study constitutes the entire ninety-five (95) 400-level B.Sc. (Ed.) Economics students of Federal College of Education, Zaria, affiliated with Usmanu Danfodiyo University, Sokoto. The population comprised sixty-three (63) males and thirty-two (32) females respectively.

Sample and Sampling Technique

The study employed a systematic sampling technique. The technique was used to prevent bias and to ensure that each student had an equal chance of being selected. To determine the sample interval the following formula was used:

$K = N/n$

Where:

K = Sample interval

N = Total population size of 400 level B.sc (Ed) Economics Student

n = Desired sample size

$K = 95/60$

$K = 1.58$

$K \approx 2$

The sample interval was rounded up to the nearest whole number $K \approx 2$.

So, a systematic sample with a random start of every 2nd number of students on the register was selected in the study. The calculated sample size for the research study is sixty (60) 400-level B.Sc. (Ed.) Economics students of the Federal College of Education, Zaria, affiliated with Usmanu Danfodiyo University, Sokoto.

Since the study was limited to the use of ICT in the laboratory teaching. The sample students were further divided into two equal and proportionate groups, the experimental group and the control group, each with thirty (30) students.

Instrument

The instrument used for this study is the Econometrics Achievement Test (EAT). The Econometrics Achievement Test (EAT) was self-generated and designed by the researchers to assess students' knowledge both before and after the test. Statistical Package for Social Science (SPSS) version 19 was used to analyze the data at $p \leq 0.05$ level of significance.

Validity of the Econometrics Achievement Test (EAT)

With the assistance of two Econometricians in the Department of Economics, Federal College of Education Zaria, the test's validity was verified and the content validity of the Econometrics Achievement Test (EAT) was assessed, critiqued and examined concerning the following:

i. Whether the test items conform to the objectives of the content and specifications it is to test.
ii. Whether the items are clear, precise and free from ambiguity.

Reliability of the Econometrics Achievement Test (EAT)

The Spearman-Brown Prophecy was used to calculate the research tool's reliability. The result was 0.82, which showed that the instrument was both dependable and within statistical bounds.

Pilot Test

One week pilot test was conducted on ten (10) members of the experimental groups on computer software, generating data from statistical bulletins, and saving data in Excel.

Use basic descriptive statistics, ordinary least square regression, and other statistical tools for economic analysis to analyze the data after importing it from Excel. Seven days later, both groups of respondents took a post-test.

Procedure

Two econometrics instructors with the same training and experience were chosen with the official approval of the department head to eliminate unneeded variables. The researchers scheduled three meetings with the instructors before the experiment was conducted to go over the goals and methodology of the investigation. The study was conducted for a period of six (6) weeks during which instructors in the experimental group were instructed to use computers, the internet, econometrics tools for economic analysis, and other software packages for teaching, whereas instructors in the control group were instructed to stick to conventional teaching methods. Similarly, students in the experimental groups received six (6) week-long training in computer software, assignment writing, internet browsing, generating data from statistical bulletins, and saving data in Excel. Use basic descriptive statistics, ordinary least square regression, and other statistical tools for economic analysis to analyze the data after importing it from Excel. Seven days later, both groups of respondents took a post-test.

Result

Version 19 of the Statistical Tools for Social Sciences (SPSS) was used to analyze and interpret the results to address the study topics.

Research Question One

Is there a significant difference in the mean academic achievement scores of the control and experimental groups on the pretest?

Table 1: Analysis Between the Performance of the Experimental and Control group

Groups	N	Mean	Variance	Std. Dev	Mean Score Diff
Experimental	30	26.75	46.84	6.84	
Control	30	23.00	40.50	6.36	3.75
Total	60				

The result in Table 1 above shows that the experimental group has a mean of 26.75, while the control group has a mean of 23.00 and the mean difference was observed to be 3.75. To test whether the variance is significant or not the formulated hypothesis was subjected to statistical t-test analysis.

Research Hypothesis one

$H0_1$ = There is no significant difference in the mean academic achievement scores of the control group and experimental group on the pretest. The result is presented in the table below

Table 2: Independent Sample T-Test Results Comparing Pre-Test Academic Scores of Control and Experimental Groups

Group	N	Mean	Variance	Std.Dev.	Df	t-cal	t-crit	Division
Experimental	30	26.75	46.81	6.84	29			
Control	30	23.00	40.50	6.36	29	2.23	2.00	rejected
Total	60				58			

The result shown in Table 2 revealed that t-calculated has a value of 2.23, while t-critical has a value of 2.00 for df = 58 at 95% confidence level ($p \leq 0.05$). Since t-calculated is greater than t-critical, the null hypothesis is therefore rejected. This signifies that there is a significant statistical difference between the mean difference in academic achievement of control and experimental groups on the pretest.

Research Question Two

How does the mean academic achievement performance of students taught using ICT-based teaching methods compare with those taught using conventional methods on the post-test?

Table 3: Analysis Between the Mean Performance of Students Who Were taught while Using ICT and the Academic Performance of Students Who Were taught through Conventional Teaching Methods on post-test?

Groups	N	Mean	Variance	Std. Dev	Mean Score Diff
ICT	15	27.60	56.69	7.53	
Conventional Teaching	15	27.33	42.69	6.31	0.27
Total	30				

The result in Table 3 shows that ICT has a mean of 27.60, while conventional teaching has a mean of 27.33 and the mean difference was observed to be 0.27. To test whether there is a significant difference between the variance, hypothesis two is subjected to statistical analysis.

Research Hypothesis Two

$H0_2$ = There is no significant difference in the mean academic performance scores of students taught Using ICT-based teaching methods and those taught using conventional teaching methods on the post-test. The result is shown in the table below:

Table 4: Analysis of Variance Results Comparing Post-Test Academic Performance Scores of Students Taught Using ICT-Based and Conventional Teaching Methods.

Group	N	Mean	Variance	Std.Dev.	Df	t-cal	t-crit	Division
ICT	30	27.60	56.69	7.53	14			
Conventional teaching	30	27.33	42.69	6.93	14	1.29	2.05	Accepted
Total	60				28			

The result shown in Table 4 revealed that the t-calculated is 1.29, while the t-critical 2.05 with df = 28 at 95% confidence level. Since t-calculated is less than t-critical, hence null hypothesis two is accepted. This means that there is no significant difference in the mean performance of students taught using ICT and students taught using conventional teaching methods.

Research Question 3

Is there a significant difference in the mean retention scores of students taught using ICT-based teaching methods and the retention of students taught using conventional teaching methods?

Table 5: Analysis Between the Mean Difference in Retention of students who were taught using ICT and the retention of students taught using a conventional teaching method

Groups	N	Mean	Variance	Std. Dev	Mean Score Diff
ICT	15	27.60	56.69	7.53	
Conventional Teaching	15	27.33	42.69	6.31	0.27
Total	30				

Table 5 displays the mean for ICT at 27.60, compared to the mean for conventional instruction at 27.33. The mean difference was found to be 0.27. The third hypothesis is statistically analyzed to see if there is a significant difference in the variance.

Hypotheses Three

$H0_3$ = There is no significant difference in the mean retention scores of students taught using ICT-based teaching methods and those taught using conventional teaching methods.

The result is shown in the table below:

Table 6 Independent Sample T-Test Results Comparing Retention Scores of Students Taught Using ICT-Based and Conventional Teaching Methods.

Group	N	Mean	Variance	Std.Dev.	Df	t-cal	t-crit	Division
ICT	30	27.60	56.69	7.53	14			
Conventional teaching	30	27.33	42.69	6.93	14	1.29	2.05	Accepted
Total	60				28			

Table 6 results indicate that, at a 95% confidence level, t-calculated is 1.29 and t-critical is 2.05 with df=28. The null hypothesis three is accepted since the t-calculated is smaller than the t-critical. This indicates that there is no discernible difference between the retention rates of pupils taught using ICT and those taught using traditional teaching methods.

Discussion of Findings

The study was conducted to examine the comparative analysis of the effects of ICT-based and conventional teaching methods on student-centred learning among undergraduate students affiliated with FCE, Zaria, Kaduna State - Nigeria. The results obtained in testing hypothesis 1 revealed that the analysis between the performance of experimental and control groups indicated that the mean difference between the experimental and control groups was observed to be 3.75 and the independent sample t-test results comparing pre-test academic scores of control and experimental groups revealed that t-calculated has a value of 2.23, while t-critical has a value of 2.00 for df=58 at 95% confidence level ($p \leq 0.05$). Since t-calculated is greater than t-critical, the null hypothesis is therefore rejected. This signifies that there is a significant statistical difference between the mean difference in academic achievement of control and experimental groups on the pretest.

The results obtained in testing hypothesis 2 revealed that the analysis between the mean

performance of students who were taught while using ICT and academic performance of students who were taught through conventional teaching method on post-test shows that the mean difference between the academic achievement of experimental and control group was observed to be 0.27 and the analysis of variance results comparing post-test academic performance scores of students taught using ICT-based and conventional teaching methods revealed that t-calculated is 1.29, while t-critical 2.05 with df=28 at 95% confidence level. Since t-calculated is less than t-critical, hence null hypothesis two is accepted. This means that there is no significant difference in the mean performance of students taught using ICT and students taught using conventional teaching method.

The results obtained in testing hypothesis 3 revealed that the analysis between the mean difference in retention of students who were taught using ICT and the retention of students taught using conventional teaching method was found to be 0.27 and the independent sample t-test results comparing retention scores of students taught using ICT-based and conventional teaching methods indicated that, at a 95% confidence level, t-calculated is 1.29 and t-critical is 2.05 with df=28. The null hypothesis three is accepted since the t-calculated is smaller than the t-critical. This indicates that there is no discernible difference between the retention rates of pupils taught using ICT and those taught using conventional teaching methods.

Conclusion

Before testing after the test, since the study was experimental in nature, Equivalent Group Design was used. Based on the pretest findings, respondents were divided into equivalent experimental and control groups. The researcher created the econometric accomplishment test (EAT), which was the instrument employed in the study. Version 19 of the statistical packages for social sciences (SPSS) was used to examine the data at the 0.05 level of significance. At $p \leq 0.05$, the second and third hypotheses were accepted while the first hypothesis was rejected.

According to the study, students who are taught using ICT and those who are taught conventionally both perform better in terms of developing their ability to observe, ask questions, practice manipulative skills, and pique students' interests—but only when the necessary tools are available and enough time is allotted to the teaching method. The study provides more evidence that both traditional classroom instruction and the use of ICT can support meaningful learning and improve students' academic achievement in econometrics.

Recommendations

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

- It is recommended that instructors teaching econometrics receive training on utilizing ICT as a learner-centred, activity-based teaching technique and ensure effective and efficient utilization of a variety of instructional approaches/techniques for teaching econometrics since it will minimize the dominance of instructors by focusing on group work, which will enable students to communicate and share experiences.
- To enhance instructors' pedagogical approach to the teaching of econometrics ample time should be allotted when teaching econometrics to guarantee efficient and effective delivery and reception during the teaching and learning process.
- Instructors teaching econometrics should employ the use of ICT and other conventional teaching strategies to enhance meaningful teaching and learning processes.

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ASSESSMENT OF ICT INTEGRATION IN TEACHING, LEARNING AND ASSESSMENT PRACTICES AMONG COMPUTER EDUCATORS IN HIGHER INSTITUTIONS IN THE NORTH EAST ZONE, NIGERIA

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This study evaluates the integration of information and communication technology (ICT) tools in enhancing teaching and learning within higher education institutions in northeastern Nigeria. Despite the pervasive influence of ICT across various sectors, its impact on education remains limited. This research specifically assesses how computer educators in the northeastern region integrate ICT facilities to enhance educational outcomes. Employing a survey research design, the study targeted 120 computer educators from three institutions (one private university, one state university, and one federal university). Data were collected through a structured questionnaire and analysed using means, standard deviations, and ANOVA testing at a 0.05 significance level. The findings indicate effective ICT integration for material delivery; however, there is inadequate use for student assessment processes.

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Introduction

The integration of information and communication technology (ICT) in education represents a critical advancement towards achieving quality learning environments. While ICT has revolutionized numerous sectors—including medicine, business, and government—its adoption in education has been relatively muted (Cantabrana, Rodríguez, & Calvo, 2019). Effective integration of ICT can tailor educational experiences to meet diverse student needs, enhancing engagement and academic performance. The importance of ICT in the management of higher education cannot be overstated; it facilitates improved administrative processes, data management, and communication channels, which are essential for modern educational institutions.

In Nigeria, the potential of ICT to transform educational practices is significant; however, challenges such as inadequate infrastructure and insufficient digital skills among educators hinder its effective implementation (Igbokwe, 2022; Tella & Adu, 2019). The integration of ICT is particularly relevant for computer educators, as it not only enhances their teaching methodologies but also prepares students for a technology-driven workforce. Research indicates that integrating ICT into teacher education programs leads to improved pedagogical skills and better learning outcomes for students (Zheng, Long, Zhong, & Gyasi, 2022; Giannakos, Jaccheri & Krogstie, 2021).

Moreover, the COVID-19 pandemic has accelerated the adoption of digital tools in education, highlighting both the benefits and challenges associated with online learning environments (Adedoyin & Soykan, 2020). Experiences gained during this period underscore the necessity for teacher education programs to effectively utilize technology in

their curricula. This study aims to assess the current state of ICT integration among computer educators in northeastern Nigeria, providing insights into best practices and identifying barriers to successful implementation.

Statement of the Problem

Despite ongoing efforts to integrate information and communication technology (ICT) into higher education curricula, significant barriers continue to impede effective implementation. Key challenges include limited access to technological resources, inadequate training for educators, and a lack of motivation among teachers to adopt ICT as an instructional tool (Bahri, Zainuddin, & Ahmad, 2021). These barriers not only contribute to poor student performance but also restrict the potential benefits that ICT can offer in educational settings.

Moreover, while higher education institutions have established computer science programs aimed at incorporating ICT into their curricula, many educators still struggle to effectively utilize these technologies in their teaching practices. This gap highlights a critical disconnect between the availability of technological resources and the actual pedagogical application of these tools in the classroom. Addressing these issues is essential for improving instructional delivery and preparing students for a digital future.

The necessity of this study is underscored by the growing reliance on technology in education, particularly in light of recent global shifts towards online learning environments due to events such as the COVID-19 pandemic. As educational institutions increasingly adopt digital tools, understanding the barriers and facilitators of ICT integration becomes imperative. This research aims to identify specific gaps in ICT integration within teaching, learning, and assessment practices in higher education, particularly among computer educators. By exploring these gaps, the study seeks to provide actionable insights that can inform policy development and enhance the quality of education in Nigeria's higher education system.

Objectives of the Study

The primary aim of this research is to assess the integration of ICT facilities in enhancing teaching and learning among computer educators in northeastern Nigeria. The specific objectives are to:

1. Investigate the extent to which ICT facilities are integrated into material delivery procedures for teaching and learning.
2. Examine how individual computer educators utilize ICT facilities in their material delivery procedures.
3. Determine the level of ICT integration in the assessment of learning outcomes in higher institutions.

Research Questions

The study seeks to answer the following research questions:

1. To what extent are ICT facilities integrated into material delivery procedures for teaching and learning in higher institutions?
2. How do individual computer educators utilize ICT facilities in their material delivery procedures?
3. What is the level of integration of ICT facilities in assessing learning outcomes in higher institutions?

Research Hypotheses

The following null hypotheses were formulated to guide this research:

$H0_1$: There is no significant difference in the mean ratings of computer educators from private, state, and federal universities regarding the integration of ICT facilities into material delivery procedures.

$H0_2$: There is no significant difference in the mean responses of computer educators from private, state, and federal universities concerning the integration of ICT facilities as instructional material delivery processes.

$H0_3$: There is no significant difference in the mean ratings of computer educators from private, state, and federal universities regarding the integration of ICT facilities in assessing learning outcomes.

Methodology

Research Design

This study employs a descriptive research design to explore the integration of information and communication technology (ICT) among computer science educators in northeastern Nigeria. This design is appropriate for capturing the current state of ICT adoption and its implications for teaching and learning practices within higher education.

Population

The research population comprises 120 computer science educators, including 90 lecturers and 30 instructors, from three higher education institutions offering computer science programs: Pen Resource Academy University (Private), Yobe State University (State), and Abubakar Tafawa Balewa University (Federal). The selection of these three institutions was based on their established computer science programs and their commitment to integrating ICT into their curricula. By including institutions from different categories, the study aims to capture a wide range of experiences and perspectives regarding ICT integration in higher education.

Sampling Technique and Sample Size

A stratified random sampling technique was utilized to ensure representation across different levels of educators within the institutions. This method allows for a more comprehensive understanding of the diverse experiences and challenges faced by educators at various academic ranks. The total sample size of 120 was determined based on the accessibility of participants and the need to gather sufficient data for robust analysis.

Instrument for Data Collection

Data were collected using a structured questionnaire specifically designed for this study. The questionnaire included both closed-ended and open-ended questions to capture quantitative data on ICT usage as well as qualitative insights into educators' perceptions and experiences.

Validity of the Instrument

To ensure the validity of the instrument, a panel of experts in educational technology reviewed the questionnaire. Their feedback was incorporated to refine the questions, ensuring that they accurately measure the constructs related to ICT integration in teaching, learning, and assessment practices.

Reliability of the Instrument

The reliability of the questionnaire was assessed using Cronbach's alpha coefficient, achieving a score above 0.80, indicating high internal consistency among the items. This suggests that the instrument is reliable for measuring educators' attitudes and practices regarding ICT integration.

Procedure for Data Collection

Data collection was conducted over four weeks. Educators were approached through their respective institutions, where they were provided with information about the study's purpose and significance. Participation was voluntary, and informed consent was obtained from all respondents before distributing the questionnaires.

A structured questionnaire titled **"ICT Integration in Teaching, Learning, and Assessment Practices"** was developed as the

primary research instrument for data collection. The questionnaire was self-constructed to align with the study's objectives and consisted of 25 items measured on a 4-point Likert scale: Often Integrated (4 points), Sometimes Integrated (3 points), Rarely Integrated (2 points), and Never Integrated (1 point). The structure of the questionnaire is as follows:

- **Section B**: 8 items addressing research question 1, focusing on the implementation of ICT in teaching practices.
- **Section C**: 8 items assessing individual utilization of ICT for research question 2.
- **Section D**: 9 items examining ICT integration in assessment practices for research question 3.

To ensure content validity, the instrument was reviewed by two experts from the Science/Education Department at Abubakar Tafawa Balewa University. Their feedback was instrumental in refining the questionnaire to ensure that it accurately measures the constructs related to ICT integration. The reliability of the instrument was assessed through a pilot study conducted with 20 computer educators from the three universities involved in the main study. The pilot test aimed to evaluate the consistency of responses across different items. The reliability coefficients obtained through Cronbach's alpha technique were found to be satisfactory, with values of 0.90, 0.78, and 0.88 for different sections, yielding an overall reliability index of 0.92. This indicates a high level of internal consistency and suggests that the instrument is reliable for measuring educators' attitudes and practices regarding ICT integration.

Data collection involved administering 120 copies of the structured questionnaire to respondents through trained field research assistants, with two assistants assigned to each university. This approach ensured that the distribution process was efficient and that respondents received adequate support in completing the questionnaire. Once completed, the questionnaires were collected for subsequent statistical analysis. This method of data collection not only facilitated a smooth process but also helped maintain the integrity of the responses, as trained assistants were available to clarify any questions or concerns from the participants. The retrieval of completed questionnaires was crucial for ensuring a robust dataset that accurately reflects the perspectives of computer science educators regarding ICT integration in their teaching practices.

Data were analyzed using descriptive statistics (mean and standard deviation) to address research questions while ANOVA was employed to test hypotheses at a significance level of 0.05. Mean scores above 2.50 indicated high integration while scores below indicated poor integration.

Presentation of Data Analysis

Table 1: Integration of ICT Facilities in Material Delivery Procedures

S/N	ICT Facilities	M	STD DEV.	REM
1	Computer: for input of data, process, and material delivery procedure	2.95	0.98	HI
2	Email: for sending and receiving information	2.75	0.96	HI
3	Telephone (mobile): To deliver lectures and material delivery	2.96	0.89	HI
4	Video conferencing: Presentation of lecture	2.14	0.91	LI
5	Teleconferencing: To deliver instructional materials	2.42	0.88	LI

6	Internet: for sending materials to the class	2.94	0.86	HI
7	YouTube: for virtual learning	2.43	0.79	LI
8	Google Classroom: for class discussion	2.78	0.85	LI

REM: Remark, HI: High Integration, LI: Low Integration

Table 1 indicates that four out of eight items had mean responses above the benchmark of 2.50, demonstrating effective integration by computer educators regarding material delivery procedures.

Table 2: Individual Utilization of ICT Facilities

S/N	ICT Facilities	M	STD DEV.	REM
1	Web-based: Integration of web-based to enhance Individualized teaching and learning	2.98	0.82	HI
2	Internet: It aids individual computer educators to access e-resources	2.72	0.88	HI
3	MP4: Integration of tutorial packages on MP4	2.87	0.95	HI
4	MP3: Integration of tutorial packages on MP3	2.69	0.98	HI
5	Search engine: To enhance self-learning	2.93	0.87	HI
6	Social media platform: To achieve several options for learning environment at their own time	2.66	0.62	HI
7	Online method: Using the online method in the source of documents for individualized teaching and learning	2.79	0.69	HI
8	E-Library: `Integration of e-library for students to learn at their own pace	2.82	0.82	HI

REM: Remark, HI: High Integration, LI: Low Integration

Table 2 shows that most responses regarding individual utilization had mean scores above the threshold indicating high levels of integration among computer educators.

Table 3: Integration of ICT Facilities in Assessment

S/N	ICT Facilities	M	STD DEV.	REM
1	The integration of ICT facilities in assessing digital learning in the subject(s) you learn	2.24	0.94	LI
2	To integrate ICT facilities in checking for professional career opportunities	2.40	1.11	LI

3	The integration of ICT facilities to monitor and assess progress and performance report	2.44	0.78	LI
4	The integration of ICT facilities in the marking of student's examination scripts	2.42	0.79	LI
5	The integration of ICT facilities in the learning platform for Downloading/uploading learning materials	2.32	0.79	LI
6	Computer educators use ICT facilities in results presentations	3.42	0.64	HI
7	The integration of ICT facilities in designing students' projects	3.16	0.79	HI
8	The integration of ICT facilities in the typing of exam questions for students	3.44	0.75	HI

Table 3 reveals that five out of eight items showed mean responses below the benchmark indicating inadequate use of ICT facilities for assessing student learning outcomes.

Hypotheses Testing & Results

Hypothesis $H0_1$: There is no significant difference within the mean opinion of Computer educators in Private, State, and Federal Universities on the integration of ICT facilities as materials delivery procedure in teaching and learning in higher institutions.

Table 4: Analysis of variance (ANOVA) on the difference in the mean rating scores on the extent of integration of ICT Facilities for material delivery procedure in teaching and learning in higher institutions.

Source	Some of squares	df	Mean Square	F-ratio	Sig.	Remark
Between Groups	3.609	2	1.854	2.826	0.050	Not Sig.
Within Groups	71.144	110	0.654			
Total	74.754	112				

ANOVA results indicated no significant differences among educator groups regarding material delivery procedures. The F-ratio was found to be not significant at the 0.05 level of significance, with F (2,110) = 2.826 and p>0.05. The computed F-ratio of 2.826 with a p-value of 0.080 exceeded the 0.05 level of significance at 110 degrees of freedom. As a result, the null hypothesis was rejected, indicating that there is no significant difference within the mean opinions of computer educators from private, state, and federal universities on the integration of ICT facilities as material delivery procedures for teaching and learning in higher institutions.

Hypothesis $H0_2$: There is no significant difference in the mean responses of Computer Educators in the Private, State, and Federal Universities on the integration of ICT in the integration of ICT Resources as the instructional material delivery process by each computer educator in North East region

Table 5: Analysis of variance (ANOVA) on the difference in the mean responses of Computer Educators in Private, State, and Federal Universities on the integration of ICT in the integration of ICT facilities as the instructional material delivery process by each computer educator in North East region

Source	Sum of squares	df	Mean Square	F-ratio	Sig.	Remark
Between Groups	0.22	2	0.106	0.111	0.05	Not Sig.
Within Groups	61.815	110	0.658			
Total	62.035	112				

Table 5 above presents the ANOVA results similarly showing no significant differences among educator groups concerning instructional material delivery processes. The F-ratio was found to be not significant at the 0.05 level of significance, with F(2,110) = 0.111 and p>0.05. The computed F-ratio of 0.111 with a p-value of 0.05 exceeded the 0.05 level of significance at 112 degrees of freedom. Consequently, the null hypothesis was rejected, indicating that there is no significant difference in the mean opinions of computer educators from private, state, and federal universities in the Northeast region regarding the integration of ICT facilities as material delivery procedures for teaching and learning in higher institutions.

Hypothesis $H0_3$: There is no significant difference within the mean rating of Computer Educators in the Private, State, and Federal Universities on the integration of ICT Facilities in the assessment of learning in higher institutions in the Northeast region

Table 6: Analysis of variance (ANOVA) on the difference in the mean responses on the integration of ICT facilities in the assessment of learning in the higher institutions in North East region

Source	Sum of squares	df	Mean Square	F-ratio	Sig.	Remark
Between Groups	0.552	2	0.326	0.466	0.05	Not Sig.
Within Groups	68.429	110	0.719			
Total	68.981	112				

The ANOVA results in Table 5 above confirmed no significant differences regarding assessment practices among educator groups. The F-ratio was found to be not significant at the 0.05 level of significance, with F(2,110) = 0.466 and p>0.05. The computed F-ratio of 0.466 with a p-value of 0.05 exceeded the 0.05 level of significance at 112 degrees of freedom. Consequently, the null hypothesis was rejected, indicating that there is no significant difference in the mean opinions of computer educators from private, state, and federal universities in the Northeast region regarding the integration of ICT facilities in the assessment of learning in higher institutions.

Discussion of Findings

This research assessed the integration of Information and Communication Technology (ICT) in teaching, learning, and assessment

practices among computer educators in higher education institutions in northeastern Nigeria. The findings revealed a significant disparity between the effective use of ICT for instructional delivery and its inadequate application in assessment processes.

Addressing Research Hypotheses

1. Hypothesis $H0_1$: There is no significant difference in the mean ratings of computer educators from private, state, and federal universities regarding the integration of ICT facilities into material delivery procedures.

   Findings: ANOVA results indicated no significant differences among educator groups ($F(2,110) = 2.826$, $p > 0.05$). This suggests a consensus among educators on the integration of ICT for material delivery across different types of institutions.

2. **Hypothesis $H0_2$**: There is no significant difference in the mean responses concerning the integration of ICT facilities as instructional material delivery processes.

   Findings: Similar to H01, ANOVA results showed no significant differences ($F(2,110) = 0.111$, $p > 0.05$), reinforcing that educators across institutions share comparable views on ICT integration for instructional purposes.

3. **Hypothesis H03**: There is no significant difference regarding the integration of ICT facilities in assessing learning outcomes.

   Findings: This hypothesis was not explicitly detailed in the provided data; however, overall findings indicated low levels of ICT integration for assessment purposes, suggesting an area needing improvement.

The findings align with previous research indicating that while there is effective integration of certain ICT tools for material delivery—such as computers and email—there remains a notable deficiency in utilizing these technologies for assessment purposes (Igbokwe et al., 2022). This consistency highlights a common challenge faced by educators across various contexts.

Training and Motivation

Previous studies have pointed out that many educators lack adequate training or motivation to fully integrate technology into their teaching practices (Igbokwe et al., 2022). This aligns with the current study's findings that suggest targeted training programs focused on assessment technologies could bridge this gap.

Possible Reasons Behind Findings

The disparity between high integration levels for instructional delivery versus low levels for assessments may be attributed to several factors:

Inadequate Training

Many educators may not have received sufficient training on how to effectively use ICT tools for assessments, leading to underutilization.

Motivational Factors

A lack of motivation or perceived value in using technology for assessments could deter educators from adopting these tools.

Infrastructure Challenges

Limited access to necessary technological resources may also impede effective ICT integration in assessment practices.

Conclusion

The research underscores the need for educational institutions to focus on enhancing ICT integration not only for teaching but also significantly for assessment purposes. By addressing training gaps and providing adequate resources, institutions can improve educational outcomes and better prepare students for a technology-driven future.

Recommendations

1. Professional Development: Continuous training programs should be established to enhance digital competencies among educators by educational institutions.

2. Infrastructure Investment: The government must ensure that necessary technological infrastructure is available across higher education institutions.
3. Innovative Practices: Institutions should encourage innovative teaching practices that leverage available technologies effectively.

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AN ADVOCACY FOR THE INTEGRATION OF ARTIFICIAL INTELLIGENCE (AI) IN TEACHING AND LEARNING OF CHRISTIAN RELIGIOUS EDUCATION IN AHMADU BELLO UNIVERSITY ZARIA, NIGERIA

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This paper examines the integration of Artificial Intelligence (AI) within the context of Christian Religious Education at Ahmadu Bello University (ABU) Zaria, Nigeria. It emphasizes the transformative role of AI in enhancing educational practices, particularly during the Covid-19 pandemic, and its potential to personalize learning experiences tailored to individual students' needs. The study, predominantly based on secondary data, identifies significant contributions of AI, including personalized learning pathways, mental tutoring systems, and enhanced analysis of biblical texts, which collectively aim to foster deeper engagement and understanding among students. However, the research also highlights challenges such as data privacy concerns, potential biases in AI outputs, and the risk of over-reliance on technology, which may undermine essential human elements of education. Ultimately, the paper advocates for the ethical and responsible integration of AI in Christian education, urging stakeholders to address these challenges while harnessing AI's potential to enrich the spiritual and academic journeys of students. Recommendations for future practices and policies are provided to ensure that AI's application aligns with Christian values and promotes a safe, inclusive learning environment.

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Introduction

Christian Religious Education plays a vital role in shaping people's character and spirituality while also developing a deeper understanding of Jesus Christ's teachings. With rapid advancement of technology, particularly artificial intelligence (AI), the educational environment has experience huge paradigm shifts in tertiary institutions in the country. As artificial intelligence (AI) has got more digitised, and has become more prevalent in educational institutions, there is the need to assess it integration into the sector. It has emerged as a driving force in tertiary institutions, particularly the teaching and learning of Christian religious education at Ahmadu Bello University Zaria, and is transforming its learning landscape especially during the Covid-19 infection in 2020. Since AI has transformed many areas, and also offers significant possibilities for the growth of Christian religious education, there is need to sustain its advocacy in the sector. Its inclusion into Christian religious education makes availability and accessibility of knowledge to the students under reference which hitherto was not possible.

Leveraging AI capabilities in learning platforms enables the production of curricular tailored to each individual, taking into consideration their levels of comprehension, learning preferences, and personal development. As a result, each student can have a unique and meaningful learning experience throughout their spiritual and intellectual journey. According to Ringo and Pasaribu (2020), apart from providing specific learning goal, AI enable students to have a better grasp

of their academic routines by evaluating biblical passages. This AI analytical skill makes it important in uncovering fundamental themes in the Bible to help students to savvy contextual and thorough meanings of biblical verses.

Statement of Problem

Understanding the appropriate balance between technological advancement and religious principles allows Christian religious education to enhance students' learning experiences, helping them to grow in faith while representing the essence of Christian religious education's teachings. As technology advances, the use of AI in the teaching and learning of Christian religious education has piqued attention and could also produce mixed bag of successes and continuing challenges. However, Lang (2023) maintains that, despite AI's huge talent in teaching and learning of Christian religious education, we must be very careful when it comes to the moral implications emanating from its use since educators have the responsibility of ensuring that students feel safe while carrying out their academic activities as well as their spiritual lives. In other words, AI can lead to availability of knowledge and access to the same, it could also promote social vices in the sector. In ABU Zaria for instance, it has promoted social vices among the youths who used AI and spend unduly long time on it. Nevertheless, the researcher has noticed that its integration into the teaching and learning of Christian religious education still remain imperative. As a result, this paper therefore, sets out to advocate for integration of AI into the teaching and learning of Christian religious Education at the Ahmadu Bello University (ABU) Zaria. The materials for this study were mainly gathered from secondary sources such as Christian journals, and the internet.

Clarification of Key Concepts

Artificial Intelligence (AI)

According to Ferguson (2023), AI refers to systems or technologies that use human intelligence to execute tasks and that can evolve based on the data they collect. He further added that it is a type of digital learning whereby computers use reform learning methods to retrieve knowledge from data. Going by the above definition by Ferguson, one can say that AI is an aspect of information technology that develops intelligent computer systems that can formulate, evaluate, and react to inputs.

Christian Religious Education

Christian religious education according to Ezeobi (2022), is the teaching and learning of Christian ideas, beliefs, and customs that seek to foster spiritual advancement, virtue cultivation, and an understanding of Christian tenet and their application to daily life. The concept is based on the idea that education should help people develop a personal relationship with God and live according to Christian ideals. It is a component of the holistic-oriented education that leads students to progressive habit for social responsibility towards the community to which they belong and have a share. Abolarin and Babalola (2023) also define Christian religious education as a type of education which the curriculum, teaching techniques, and educational philosophies are founded on a Christian religious worldview that assigns existence to a supreme being. It is the cultivation and training of the intellect, emotion, and will to allow the three to function as harmoniously and optimally as possible in all circumstance. They went on to say that Christian religious education is designed to bring pupils to the acquisition of values by shaping their character

for successful life and acceptability before God in worship. It is designed and incorporated into the school curriculum and also taught at home alongside the teaching in school, since the home is the first school in human life.

Discussion of major findings.

It can never be out of place to think whether AI can be of any relevance to Christian Religious Education since artificial intelligence is a technology or intelligent machine designed to solve problems that require cognitive intelligence while Christian religious education deals with development of the person's mind, study of religious beliefs and practices, our relationship with our creator (God) and fellow human being. The answer is AI is very important in the teaching and learning of Christian religious education because the era of relying completely on orthodox method of learning is beginning to face out due to integration of AI which no doubt has transformed many areas of our lives and education is not an exception. The following is the discussion on the major findings arising from the study:

Personalised Learning

Ringo and Pasaribu (2020) submit that personalised learning is the technique that emphasises on the student's learning process and caters for their talents and concerns. This type of learning provides them with a variety of learning experiences that allow them acquire knowledge. By implication, this learning approach goes beyond the orthodox style of learning, which is one of the reasons why educators especially Christian religious educators are increasingly supporting this viewpoint, as students may benefit from a customised educational environment. According to Ocampo and Gozum (2024) one of the benefits of incorporating AI into the teaching and learning of Christian religious education is the ability to provide personalised learning experiences for each student by analyzing vast amounts of data, such as students' learning styles, comprehension levels, and spiritual development, AI can determine individual strengths, limitations, and learning preferences, allowing the construction of customised curriculum and learning materials. AI can cater for each student's distinct needs via personalised learning, ensuring that the content supplied is relevant to their unique abilities and interests. For example, students who prefer visual learning can be given multimedia-rich materials, whilst those who prefer textual learning can be given content in written form. This customised learning technique strengthens student commitment and grasp of the subject content thereby, boosting a resilient nexus between student and their study material. Due to AI modification of learning materials to match individual expectations, students feel important and reinforced in their academic journey and this consequently, can go a long way to encourage the learner to develop a sense of autonomy or influence over their academic journey resulting in greater academic achievement and deeper spiritual connection. Also, the ability of AI to assess students' progress and spiritual breakthrough within a period of time ensure continuous advancement during academic process by enabling educators to particularly note and support those students experiencing academic challenge. By accessing data in relation to students' spiritual development, AI can offer focused proposals for supplementary components that would improve spiritual understanding and connection with the Christian ideals as demonstrated in the Faculty of Education and distance learning center in ABU Zaria. In a nutshell, personalised learning using AI enables students to actively participate in their religious education, resulting in a more

meaningful and enriching spiritual experience. By taking into account individual learning preferences and spiritual needs, AI ensures that each student can start a personalised and effective learning journey that promotes deeper engagement and growth in their Christian faith (Ocampo and Gozum, 2024).

Mental Tutoring System

This is an aspect of AI-powered technique with the capability to basically reshape or modify the way students are assisted academically. Systems of this nature allow learners to electronically interact with their tutor by unveiling problem-solving test and addressing their feedback, bringing about one-on-one coaching in real time. Bradac and Kostolanyova (2017) and Khoa and Nguyen (2021) opine that using these teaching strategies, cognitive or mental tutoring systems can provide tailored help, resulting in in-depth learning and the development of critical thinking skills.

Support for Teachers

The daily lives of educators extend beyond instruction. It also entails several administrative, time-consuming, and energy-intensive chores, such as grading assignments and test, preparing materials, filling out forms, and producing reports. The application of generative AI can streamline and accelerate some of these processes and also enables the teacher to reach a large number of students at the same time, allowing teachers to work less and dedicating more time to their students' needs. Tomic and Randovanovic (2024) state that planning of lesson is one of the most time-consuming and overwhelming aspect of being a teacher, however, AI tools can mitigate or lessen this burden by generating in-depth lesson plans through gathering materials from across the internet.

Biblical Texts Analysis

Incorporating (AI) in the teaching and learning of Christian religious education is a huge benefit to students since it is equipped with proficiency to decode natural language which brings about a remarkable change for in-depth research of biblical passages in Christian religious education. According to Ojieabu (2024) AI's ability to recognise linguistic patterns, nuances, and contextual meanings allows it to delve deeply into the scriptures, bringing profound insights into biblical text patterns that aid in deeper understanding and interpretation of Christian teaching. These has been used extensively in Christian religious section in the Faculty of Education and distance learning center in ABU Zaria. Supporting Ojieabu, Dos Santos, Nizan, Israel, Nunesde, & Frango, (2023) highlight that AI's evaluation of texts in the bible has demonstrated robust findings and goes beyond superficial knowledge by pinpointing core themes, recurring ideas, and connection between various sections that cuts across the Bible. By identifying styles and comparing various sections of the scriptures, AI can present all-encompassing insight of the synergy of Christian teachings, clarifying the unity of biblical message by various writers. Based on the work of the aforementioned authors, AI can unravel the historical contexts in which biblical texts were written, and this understanding of the cultural and historical background improves the interpretation of the scriptures, providing valuable context to grasp the intended messages.

Spiritual Guidance

According to Ringo and Pasaribu (2020), one of the importance contributions of AI to the teaching and learning of Christian religious education is that it serves as online spiritual counselor guiding students through their spiritual quest. One of the thing AI does is employing data on the spiritual activities and developmental progress of students and then

offer useful guidance and recommendations that correspond to their preparation. This in return enables students conquer spiritual challenges and form a stronger relationship with God. Toevs (2023) opines that the role of AI as a virtual spiritual counsellor or advisor provides several benefits to Christian religious education students in their spiritual experiences. One of such benefits is that, AI can provide live assistance that is not limited by time and space. In this regard, students can request for spiritual assistance that can help them deal with their spiritual challenges round the clock. It is worth noting at this juncture that the ability of AI to analyse data on students' religious activities makes it easy for the system to recommend additional spiritual activities for learners by offering spiritual texts, meditation techniques, or suitable religious practices based on their understanding and interests. This on the other hand, may go a long way to make students feel more at home to interact with the machine than physical tutor, allowing them to think and progress in their academic and spiritual growth more openly. This aspect should be encouraged in the teaching and learning of Christian religious studies section of the Faculty of Education, ABU Zaria.

Challenges of Integration of AI into Christian Religious Education

It is vital to note that t2he use of AI in teaching and learning of Christian religious education has added value by making the process more successful by introducing hitherto untapped dimensions. However, the possible setbacks must not be overlooked. There are several factors that militate against the successful use of AI, a few of which are worth considering:

Safeguarding of Data

The use of AI in teaching and learning of Christian religious education specifically when it comes to online platforms and collaborative situation, brings concerns about the safety of data since it deals with collection and analysis of student data and also their spiritual activities and progress. Tomic and Randovanovic (2024), opine that to guarantee the safety of data along with student's privacy, instructor's hands should be on the desk to ensure that student data are well preserved and used entirely for educational and spiritual purposes. This should be the primary duty of educators especially in the Christian religious section of the Faculty of Education ABU Zaria to guide against the use of data gathered for learning being used for another purpose or cybercriminals installing malware into school system.

AI Technology addiction

Incorporating of AI in Christian religious education is good and a welcome idea because of the benefits derived from the use however, this should not result in an over reliance on the technology because the tendency of AI eroding human potentials is very high. Isaacs (2024) in his view states that even though AI can improve learning efficiency, it cannot replicate the depth of human educators. By implication, understanding human relationships and compassionate spiritual direction are useful in fostering students' faith and spiritual growth therefore, when students become unnecessary reliant on AI outputs without human involvement, it may limit the utility of this technology.

Accessibility of soft wares

These soft wares are very pricey, making it difficult for some institutions and students to assess them due budgetary constraints. However, this presents an accessibility issue and consequently widening the gap between those who have the purchasing power and those who do not have.

Compatibility of Content with Christian Values

One of the primary issues with integrating Artificial Intelligence (AI) in Christian religious education is making sure that the content is compatible and align with Christian teachings. The fact that AI can bring together, analyse, and present spiritual information to students cannot be overestimated, however, it is essential to ensure that the content offered is in line with Christian values and teachings. Christianity's fundamental spiritual ideals must be considered when designing AI methods and content for teaching and learning of Christian religious education. For example, AI chatbots typically collect metadata from the internet hence, the possibility of AI chatbots to gather incorrect beliefs about theology is very significant. Ty, (2023) claims that a thorough understanding of Christian theology and religious values is required to ensure that AI does not give material that violates Christian beliefs or has a harmful impact on learner's spiritual development.

Maligning and Ethical Concerns

The use of AI raises ethical concerns, such as who will be held accountable if an AI tutor provides incorrect information, and what if the teaching contains theological bias, or specific prejudices, as AI may provide recommendations or information that is unbalanced or inaccurate in the context of Christianity. For example, AI might be configured to slander or favour specific spiritual beliefs or practices, ignoring the greater spectrum of Christian teachings. It is in line with this that Ty (2023) says that constant monitoring and evaluation are required to verify that these technologies are devoid of bias and give fair and objective results, which aligns with the aforementioned difficulty.

Conclusion

It is a known fact that the integration of artificial intelligence (AI) into the teaching and learning of Christian religious education in Nigeria has come to stay and signifies an impotent advancement as the world is going digital and this is more than the ability to read and write. This has provided both educators and learners innovative devices and methodologies that provide valuable insights into Christian religious education. It is worth noting that even with this amazing skills of AI to enrich learning and educational experiences, it cannot replace human educators because there are important aspects of teaching like mentoring, emotional support which can be handled better by human teachers. Educators must make sure that the information provided with the help of AI are correct and free from theological bias and this can only be done by using the lens of God's word to critically examine and interpret them.

Recommendations

It is therefore recommended as follows:

i. The government in collaboration with the various learning institutions should create awareness on the benefit of using AI in the teaching and learning of Christian Religious Education and how it can be integrated into the system.
ii. Educators should enlighten learners that even with the capabilities of AI and the benefits derived from the use, AI cannot replace humans as it is impersonal and this could lead to loss of meaning and purpose in life.
iii. Computer literacy should be made mandatory for both teachers and students as this will go a long way to discover new methods of teaching and overcome some of the factors militating against the of use of AI in teaching and learning.
iv. Since the use of AI is of paramount importance because of its capability in the teaching and learning of Christian Religious Education, schools in

collaboration with the government, should try and make AI technology accessible for learners,

v. Ethical concerns relating to data privacy, religious biases should be addressed by educators to ensure the safety of data and students' privacy, and lastly educators should shoulder the responsibility of establishing ethically sound AI systems that are consistent with principles, thereby promoting comprehensive and integrity-driven religious education.

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LEVERAGING DIGITAL STORYTELLING TO FOSTER INTERFAITH UNDERSTANDING IN CHRISTIAN RELIGIOUS EDUCATION

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In an increasingly interconnected world, fostering interfaith understanding within Christian education is vital for promoting mutual respect and global harmony. Digital storytelling emerges as a transformative tool to bridge cultural and religious divides by engaging learners in authentic, empathetic, and reflective narratives. This paper explores how digital storytelling can be strategically leveraged in Christian education to nurture interfaith awareness, dialogue, and collaboration. By integrating multimedia elements such as videos, images, and interactive content, digital storytelling facilitates the sharing of diverse faith experiences, values, and traditions in a compelling and accessible manner. The study highlights practical approaches, including creating digital narratives about shared human values, developing interactive interfaith projects, and fostering collaborative storytelling between students of different religious backgrounds. Additionally, it examines the pedagogical benefits of digital storytelling, such as enhancing critical thinking, empathy, and cultural sensitivity. The paper concludes by offering recommendations for Christian educators, emphasizing the potential of digital storytelling to cultivate a deeper understanding of other faiths while reinforcing Christian values of love, respect, and inclusivity. This approach not only enriches Christian education but also equips students to become compassionate global citizens in a pluralistic society.

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Introduction

In a world that is more connected than ever, promoting interfaith dialogue and understanding in Christian education is very important. Traditional teaching methods often do not meet the diverse cultural and religious experiences that students face every day. Digital storytelling stands out as a strong teaching tool that can engage students and build empathy through shared narratives. By letting students share their experiences and hear from others, digital storytelling fosters an inclusive atmosphere that encourages discussion among different faith groups. This new method not only improves understanding of religious diversity but also prompts students to think critically about their own beliefs. In the end, using digital storytelling in Christian education can help connect communities, leading to a better understanding of common values and differences, which is vital for creating a peaceful society.

The importance of fostering interfaith dialogue and understanding within Christian education is more critical than ever. This lack of inclusivity can hinder meaningful dialogue and understanding among students from various faith traditions. Digital storytelling

emerges as a powerful educational tool that addresses these challenges by enabling students to express their personal experiences through multimedia formats. This method engages students actively, allowing them to share their narratives while also listening to the experiences of their peers. Such exchanges not only foster empathy but also create an inclusive atmosphere where open discussions about faith and beliefs can thrive.

Furthermore, digital storytelling encourages students to reflect critically on their own beliefs as they engage with the stories of others. This introspection is vital for personal growth and understanding, prompting students to consider how their values align or differ from those of their classmates. As students explore these narratives, they develop a deeper appreciation for religious diversity, recognizing both the commonalities and distinctions that exist among various faith traditions. Ultimately, integrating digital storytelling into Christian education can bridge gaps between communities, enhancing understanding and collaboration. By sharing their stories within and beyond the classroom, students contribute to a culture of respect and inclusivity that is essential for building a peaceful society. This approach not only enriches the educational experience but also equips students with the skills and insights necessary for navigating a diverse world. In today's globalized and pluralistic society, the need for interfaith understanding has never been more critical. As the world becomes increasingly interconnected, individuals from diverse religious and cultural backgrounds encounter one another in various contexts, necessitating mutual respect and meaningful dialogue. Within Christian education, fostering interfaith understanding is essential to cultivating empathy, promoting peace, and preparing students to engage with a diverse world. Digital storytelling offers a powerful avenue to achieve these goals by combining narrative and technology to create immersive and transformative learning experiences.

Meaning of Digital Storytelling

Digital storytelling means using digital tools to share stories, mixing different forms like text, images, audio, and video to make interesting and interactive narratives. In education, especially in Christian settings, digital storytelling is not just a way to share religious beliefs but also a way to encourage discussions and understanding between different faiths. By using personal stories, teachers can help start important talks about faith traditions, which can build empathy and connections among varying religious groups. This method reflects what groups like the Interfaith Youth Core say about the need for personal engagement and more in-depth theological conversations in interfaith relationships (Weiss et al., 2016). Additionally, digital storytelling can bring back the importance of religious stories in promoting peace, showing the common values that unite religions and improving respect and understanding among students of diverse backgrounds (Sarpiya et al., 2018).

Digital Storytelling: A Transformative Educational Tool

Digital storytelling is an innovative educational approach that combines traditional storytelling with multimedia elements such as images, audio, video, and text. It allows individuals to create and share personal or collective narratives in a compelling and accessible format. This method has gained popularity in educational settings due to its ability to engage learners, foster creativity, and enhance critical thinking skills. In the context of interfaith understanding, digital storytelling serves as a platform for sharing diverse faith experiences and perspectives. It enables students to explore commonalities and

differences among religions through authentic and emotionally resonant narratives. By leveraging technology, educators can create immersive experiences that go beyond textbooks, encouraging students to interact with stories that reflect the lived realities of people from various faith traditions.

Practical Applications of Digital Storytelling in Christian Education

1. **Creating Shared Narratives:** Christian educators can guide students in creating digital narratives that highlight shared human values such as compassion, forgiveness, and hope. For example, students might produce videos or podcasts that compare how different religious traditions address universal themes like caring for the poor or seeking justice. Such projects can underscore the common ground among faiths while reinforcing Christian values.
2. **Developing Interactive Interfaith Projects:** Collaborative projects involving students from diverse religious backgrounds can foster meaningful dialogue and mutual understanding. For instance, Christian schools can partner with schools of other faith traditions to create digital storytelling projects that explore religious festivals, rituals, or personal faith journeys. This collaboration allows students to learn directly from peers of other faiths, breaking down stereotypes and fostering empathy.
3. **Integrating Historical and Scriptural Contexts:** Digital storytelling can also be used to explore the historical and scriptural contexts of interfaith encounters. Students can create multimedia presentations about interfaith figures, such as St. Francis of Assisi's encounter with Sultan Malik al-Kamil, or explore scriptural passages that encourage inclusivity and love for all people. These stories can inspire students to see interfaith engagement as a vital part of their Christian witness.
4. **Encouraging Reflection and Dialogue:** Digital storytelling provides a platform for students to reflect on their own beliefs and engage in dialogue with others. Educators can assign projects where students interview individuals from different religious backgrounds, documenting their stories and insights. These reflective exercises help students develop critical thinking skills and a deeper appreciation for diverse perspectives.

Impacts of Digital Storytelling

The use of digital storytelling in Christian education offers numerous impacts:

Enhanced Engagement: The interactive and multimedia nature of digital storytelling captures students' attention and sustains their interest.

Empathy Development: By immersing students in the personal narratives of others, digital storytelling fosters empathy and emotional intelligence.

Critical Thinking: Analyzing and creating digital stories encourages students to think critically about religious and cultural narratives.

Cultural Sensitivity: Exposure to diverse stories broadens students' understanding of other cultures and faiths, promoting inclusivity.

Creative Expression: Digital storytelling allows students to express their ideas creatively, combining technical and artistic skills.

Importance of interfaith dialogue in education

The importance of talking between different faiths in schools is very high, especially for creating respect and understanding among various beliefs. By adding storytelling to lessons, teachers can make a space where students share meaningful conversations about their religions and experiences. This method not only supports spiritual growth but also tackles the current issues on college campuses, like growing division and mental health problems, as mentioned in (Call et al., 2018). Interfaith talks can be a way to change conflicts, using the rich backgrounds of Abrahamic religions that focus on shared values and building communities, promoting peace and teamwork among different groups, as noted in (Sarpiya et al., 2018). In the end, using digital storytelling in this setup boosts the chance for real connections and mutual respect, forming a base for more inclusive learning experiences.

The significance of interfaith dialogue in educational settings is crucial for fostering respect and understanding among diverse belief systems. Engaging students in conversations about different faiths can cultivate an environment where diversity is valued, and mutual respect is promoted. By integrating storytelling into the curriculum, educators can facilitate a space where students share personal narratives related to their religious backgrounds and experiences. This practice not only encourages spiritual growth but also addresses contemporary issues on college campuses, such as rising divisions and mental health challenges (Call et al., 2018).

Storytelling serves as a powerful tool for conflict transformation, particularly within the context of Abrahamic religions, which emphasize shared values such as compassion, justice, and community. As highlighted by Sarpiya et al. (2018), interfaith conversation can utilize these common principles to promote peace and collaboration among various groups. These conversations unites them rather than what divides them, students can foster a sense of belonging and understanding, which is essential in today's polarized environment.

Furthermore, the use of storytelling into this framework enhances the likelihood of authentic connections among students. This method allows individuals to express their beliefs and experiences creatively, leading to deeper understanding and empathy. Ultimately, this approach not only enriches the learning experience but also establishes a foundation for more inclusive educational environments, preparing students to navigate and appreciate the complexities of a multicultural world.

Overview of the Role of Digital Story-Telling in Christian Education

Digital storytelling is becoming an important tool in Christian education, providing a way for learners to engage with faith stories and talk about different religions. This approach lets teachers use multimedia resource, encouraging students to talk about their own spiritual experiences while helping them understand various beliefs better. By using storytelling techniques, teachers can make environments where students listen and think about their experiences, building community among people from different backgrounds. According to (Call et al., 2018), these story-based methods help students grow spiritually and develop leadership skills, connecting different religious identities. Moreover, the role of religious stories in promoting peace is discussed in (Sarpiya et al., 2018), showing how digital storytelling can bring together the teachings of Christianity, Judaism, and Islam. Overall, digital storytelling

not only enhances Christian education but also helps create respect and understanding among different faiths.

Digital storytelling is increasingly recognized as a vital tool in Christian education, facilitating learners' engagement with faith narratives and fostering discussions about various religions. This innovative approach incorporates multimedia resources such as videos, podcasts, and digital art allowing educators to present religious stories in dynamic and relatable ways. By encouraging students to share their own spiritual experiences, digital storytelling not only enhances personal reflection but also deepens their understanding of different beliefs (Call et al., 2018). Utilizing storytelling techniques enables educators to create inclusive environments where students feel safe to listen, reflect, and articulate their experiences. This communal aspect is essential in building relationships among students from diverse backgrounds, as it nurtures empathy and promotes a sense of belonging. Call et al. (2018) note that story-based methods contribute to spiritual growth and the development of leadership skills, helping students navigate their own religious identities while connecting with those of others.

Moreover, the potential of religious stories to foster peace is explored by Sarpiya et al. (2018), who assert that digital storytelling can effectively bridge the teachings of Christianity, Judaism, and Islam. By highlighting shared values and common narratives, this approach encourages dialogue and understanding across different faiths. Such storytelling practices not only enrich Christian education but also cultivate respect and appreciation among diverse religious communities.

Concept of Digital Storytelling

Digital storytelling is a strong way to help promote talks between faiths and improve understanding in Christian education. It creates a space for reflection and sharing stories. Through storytelling, people can share their personal experiences and bring in different religious views, showing shared values and experiences. This method helps build empathy and creates a sense of community among those involved. Also, as seen in effective programs in schools, digital storytelling allows exploration of different faiths, which supports overall growth and spiritual development in students (Call et al., 2018). By listening to others' stories, participants learn to recognize and respect their differences while discovering common beliefs, which are important for creating peace among the Abrahamic religions (Sarpiya et al., 2018). Therefore, digital storytelling is a useful teaching tool for building interfaith understanding and teamwork.

Historical Context and Evolution of Digital Storytelling

A background of digital storytelling shows how it has grown as a useful educational method, especially for promoting interfaith conversations in Christian education. It started from old storytelling methods, and with new technology, it has changed to allow more interaction through multimedia tools. This change is important in varied societies where stories can create understanding and empathy among differing beliefs. For example, in Germany, there has been cultural and religious diversity since the Reformation, influencing social interactions and stories (Spohn et al., 2018). Likewise, in Indonesia, modern literature shows how digital storytelling can mix interfaith subjects with popular stories, helping young audiences connect to crucial values for peace and understanding (Ichwan et al., 2022). Therefore, the historical change in

digital storytelling not only shows advancements in technology but also emphasizes its important role in encouraging interfaith dialogue and educational growth in Christian settings.

Key Elements of Effective Digital Storytelling

Effective digital storytelling relies on several important parts that improve communication and increase engagement in educational settings, especially in fostering interfaith dialogue. One main part is making interesting stories that emotionally connect with listeners; narratives that highlight common values of the Abrahamic faiths can help build empathy and understanding between diverse religious groups. Using multimedia features, like images and sound, adds to these narratives, helping to create stronger connections and making difficult theological concepts easier to understand. Additionally, encouraging interaction during the storytelling process allows participation, letting learners share their views and stories, thus creating a team-based learning setting. Recent research shows that these methods not only build a sense of community but also promote dialogue that is crucial for peace-making, supporting the idea that "religion plays an important role in society," as mentioned in (Sarpiya et al., 2018) and (Mello-Théry et al., 2013).

Tools and Platforms for Creating Digital Stories

In digital storytelling, many tools and platforms have come up to help make and share stories that improve interfaith conversation and understanding. Tools like Adobe Spark and Storybird help teachers and students make stories that look good and include different media, which makes them more emotional and relatable in various religious settings. Also, platforms such as YouTube and Sound Cloud enable wider sharing of these digital stories, reaching audiences outside of the classroom and encouraging discussion among various faiths. Moreover, narrative journalism, mentioned in Sabaté Gauxachs et al., (2020), still plays a key role in closing cultural divides by using writing techniques to share human stories that promote empathy and understanding. This storytelling method not only supports educational aims but also matches the idea that storytelling can spark meaningful cultural and religious discussions, as noted in Sabaté Gauxachs et al., (2020).

Interfaith Dialogue in Christian Education

Interfaith talks in Christian education are important for improving understanding and teamwork among different religious groups. With more educational systems using digital storytelling, they allow students to learn about different faiths' stories, helping them develop empathy and a wider cultural view. By using storytelling, students can look into common values and experiences, especially among the Abrahamic faiths, which usually stress peace and doing good (Sarpiya et al., 2018). This engaging method lets students see how various religious traditions deal with common problems and highlights the importance of being united despite differences. As schools use digital tools for these conversations, they reinforce the vital function of religious education in promoting social peace and solving conflicts in a more diverse society (Mello-Théry et al., 2013). In the end, encouraging interfaith dialogue in Christian education can build a sense of cooperation that goes beyond different beliefs, supporting a shared dedication to peace.

Significance of Interfaith Dialogue in Fostering Understanding

Interfaith dialogue is important for more than just getting along; it is key to building

real understanding and respect among different religious groups. In Christian education, using digital storytelling can be a strong way to support these dialogues, as stories can express complex interfaith ideas in interesting ways. For example, modern Islamic novels, mentioned in the study, include interfaith themes in romantic plots, which attract younger readers and encourage peace building efforts ((Ichwan et al., 2022)). Also, groups like the Interfaith Youth Core (IFYC) work to connect different faiths, showing that they can act as multi-faith service groups while still allowing for deeper theological discussions to improve interfaith relationships ((Weiss et al., 2016)). By using digital platforms to share these narratives and experiences, educators can create a space where understanding is not just accepted but sought after, ultimately enhancing the important dialogue necessary in our diverse society.

Challenges Faced in Fostering Interfaith Dialogue

Promoting interfaith dialogue has many problems, mainly due to social tensions and not meeting spiritual needs in education. Schools often focus more on grades than on helping students grow spiritually, which can cause feelings of isolation and disconnection from various belief systems. This gap can lead to campus issues like increased division and mental health concerns, which shows the need for programs like the story circle model that encourages students to listen and reflect together ((Call et al., 2018)). Moreover, how religion is often portrayed in secular discussions, usually as a cause of conflict instead of a way to promote peace, makes dialogue harder. By bringing attention back to religious perspectives and highlighting common values in different faiths, especially in the Abrahamic traditions, educational efforts can help build understanding and cooperation ((Sarpiya et al., 2018)). Only by working together can we reduce the obstacles to successful interfaith dialogue.

Strategies for Integrating Interfaith Understanding in Christian Education

Bringing interfaith discussion into Christian education can help students understand different viewpoints and create a space for respect and understanding. One good method is using digital storytelling, which lets students talk about their own stories and learn about the faith journeys of others. This method not only helps with personal spiritual growth but also promotes community among students from various backgrounds, as pointed out in (Call et al., 2018). Additionally, by using historical examples like those mentioned in (Spohn et al., 2018), teachers can lead talks about the importance of cultural and religious variety, making these discussions relevant to students' lives. By encouraging students to think about their own beliefs and shared experiences, teachers can develop a setting where meaningful interfaith conversation can grow, ultimately aiding in the overall development of students in a diverse society.

Benefits of Digital Storytelling for Fostering Interfaith Understanding

In a society that is more diverse, digital storytelling becomes a valuable way to encourage discussions between different faiths, especially in Christian education. This approach helps people from various backgrounds understand each other better and build empathy while sharing personal stories that reflect common values among religions. Using technology, teachers can create welcoming environments where students feel encouraged to share their experiences, which promotes listening and thinking deeply. This interaction can strengthen bonds and help

individuals appreciate different beliefs, especially considering the spiritual gaps seen in today's education (Call et al., 2018). Also, the conversations sparked by digital storytelling may support peace building among the Abrahamic religions, as participants identify their shared dedication to moral principles and community welfare, which are crucial for fostering social harmony in the modern world (Sarpiya et al., 2018).

Enhancing Empathy and Personal Connection through Storytelling

Storytelling is a strong way to boost empathy and build personal connections in interfaith talks, especially in Christian teaching. By mixing personal stories with digital storytelling methods, teachers can create chances for students to share their own experiences, helping to build a respectful and understanding environment. This method matches what was found at Hollins University, where using storytelling and listening helped diverse student leaders shape their faith and identity, improving their community involvement (Call et al., 2018). Additionally, the involvement of teachers from different faiths in Catalonia shows how storytelling can help close gaps and enhance interfaith discussions, as many educators want to better dialogue in schools (Gelabert E et al., 2023). Through these stories, those involved not only consider their beliefs but also grow empathy for others, making storytelling a key tool for promoting dialogue and building community.

Providing Diverse Perspectives and Narratives

In interfaith dialogue, having different viewpoints and stories helps people understand various religions better. Digital storytelling is a strong tool for this, enabling people from different backgrounds to share their experiences, beliefs, and values in a shared space. For example, storytelling events held in Rockford allowed Christians, Jews, and Muslims to exchange ideas and gain a better understanding of the common moral values found in the Abrahamic religions (Sarpiya et al., 2018). When participants embraced these stories, they encountered other perspectives, which can reduce misunderstandings and foster empathy. Additionally, framing these stories in a larger context of promoting peace shifts the focus from religious differences to shared goals, showing that there is a common purpose despite differing beliefs (Mello-Théry et al., 2013). This method creates an inclusive learning environment that is crucial for educating future generations in Christian teachings.

Encouraging Collaborative Learning and Engagement among Students

To build a culture of learning together and getting involved among students, digital storytelling is a strong tool, especially for encouraging interfaith discussion in Christian education. This fresh method helps students share their own stories, connecting different backgrounds and improving understanding. With a story circle model, as mentioned in (Call et al., 2018), students participate in listening and sharing stories, which helps them grow their spiritual identities and connect with various beliefs. Moreover, its noted in (Lynch et al., 2014) shows that sharing personal experiences can change how students see themselves and each other. As students work on digital stories together, they not only improve their storytelling abilities but also create a common area for conversations that promote respect and empathy, which are crucial for successful learning in today's diverse education settings. In the end, these actions help create a more open and united academic community.

Potential impact of Digital Storytelling on Interfaith Dialogue

Digital storytelling is a new way for different faith groups to talk and understand each other. By sharing personal stories, people from different religions can tell about their experiences and beliefs, which helps build empathy and connection. This links to the idea that storytelling can be a spiritual practice that promotes listening and group reflection, as shown in (Call et al., 2018). Also, digital platforms can reach more people and connect those who are far apart geographically and culturally, making a space for dialogue that goes beyond usual limits. Additionally, the role of religious voices in fostering peace is very important; joint storytelling among Abrahamic religions promotes unity and mutual understanding, highlighting the need for cooperation for peaceful society, as discussed in (Sarpiya et al., 2018). This kind of interaction may lead to a better understanding of theological ideas and common values, ultimately improving interfaith dialogue in Christian education.

Conclusion

Digital storytelling is a powerful tool for fostering interfaith understanding within Christian education. By integrating multimedia narratives into the curriculum, educators can create transformative learning experiences that promote empathy, critical thinking, and cultural sensitivity. This approach not only enriches Christian education but also prepares students to be compassionate and respectful global citizens. As Christian educators embrace digital storytelling, they have the opportunity to cultivate a generation that embodies Christ-like love and respect in a diverse and interconnected world. Through shared stories, students can discover the beauty of diversity and the common threads that unite humanity, ultimately contributing to a more harmonious and understanding society.

Additionally, how interfaith themes are depicted in current literature shows that stories can effectively encourage peace and understanding. These themes resonate well with young audiences, sparking interest in interfaith interactions and providing a good platform for discussion, as seen in popular Islamic books (Ichwan et al., 2022). Therefore, by using digital storytelling tools, teachers can create a rich environment that both honours and celebrates the diversity of faith traditions in today's educational settings.

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ENHANCING TEACHER EDUCATION THROUGH MICROCOURSEWARE: A CASE STUDY OF THE FEDERAL UNIVERSITY OF EDUCATION, ZARIA

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This study investigates the effectiveness of Micro-courseware in enhancing teacher education at the Federal University of Education, Zaria. With the increasing integration of technology in educational practices, this research evaluates how Micro-courseware can improve learning outcomes, student engagement, and teaching methodologies. Utilizing a mixed-methods approach, data were collected through surveys, interviews, and classroom observations involving 150 students and 20 lecturers. Quantitative analysis revealed a significant increase in student performance, with average test scores rising by 20% following the implementation of Micro-courseware. Additionally, qualitative feedback indicated high levels of satisfaction among students, with 82% reporting that Micro-courseware made learning more engaging and accessible. However, challenges such as technological barriers and resistance to change were also identified. The findings suggest that Micro-courseware can play a crucial role in modernizing teacher education, offering practical recommendations for its effective integration into curricula. This research contributes to the understanding of technology-enhanced learning in Nigerian educational contexts and highlights the need for ongoing support and training for educators to maximize the benefits of Micro-courseware.

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Introduction

The teacher education landscape in Nigeria is experiencing substantial transformation aimed at enhancing educational practices and improving student results. Integrating digital tools into educational frameworks has become increasingly vital due to rapid technological improvements. This study examines the impact of Micro-courseware on improving teacher education at the Federal University of Education, Zaria, emphasising its capacity to promote effective teaching and learning methodologies.

Education is the foundation of society growth; hence the quality of teachers is critical to ensure successful learning results. In Nigeria, teacher education has made considerable strides toward improving educators' abilities and skills. However, it has historically experienced various obstacles, such as poor infrastructure and insufficient educator training. According to a report published by the National Commission for Colleges of Education (NCCE), there is an urgent need to modify teacher education programs to better prepare educators for modern classrooms. The quality of teacher education has a direct impact on teaching effectiveness and student learning outcomes. Recently, the Nigerian government realized that boosting teacher education is critical for improving overall educational quality (Ogunyemi, 2022).

In light of this, this study investigates how Micro-courseware could improve teacher preparation at Federal University of Education Zaria. Through programs created to give

students the teaching skills they need, the Federal University of Education Zaria plays a crucial role in preparing future teachers. The lack of involvement and relevance of traditional teaching approaches has frequently drawn criticism (Adebayo, 2023). As a result, educators and legislators are increasingly in agreement that incorporating technology into teacher education is essential to creating a more dynamic learning environment.

Integrating technology in education is not only a trend; it is a requirement in the 21st century. According to the World Economic Forum, pupils must be digitally literate in order to succeed in an increasingly digital society (World Economic Forum, 2023). Micro-courseware—small instructional modules offered through digital platforms—offers flexible learning opportunities that dramatically enhance educational experiences.

Research suggests that technology-enhanced learning settings can lead to greater student engagement and academic success (Zheng et al., 2022). Micro-courseware enables tailored learning experiences where students can continue at their own pace and revisit hard ideas as needed. This accords with constructivist learning theories encouraging active learning through content interaction (Jonassen, 2021).

Moreover, the COVID-19 epidemic enhanced technology use in education, highlighting both possible benefits and concerns linked with online learning (Adedoyin & Soykan, 2020). Experiences obtained during this period underline the importance for teacher education programs to successfully use technology.

In this context, deploying Micro-courseware gives a chance to address existing difficulties while aligning with global educational trends. By providing educators access to high-quality content, Micro-courseware boosts professional development and instructional practices. This study intends to evaluate its effectiveness at FUE Zaria.

The significance of this study on Micro-courseware's effectiveness involves contributions to educational practices and implications for policy development.

This research provides insights into practical applications of Micro-courseware in teacher education by identifying best practices for its integration into educational settings.

The outcomes will inform policymakers about integrating technology into teacher education programs leading to policies supporting digital tool adoption.

Purpose of the Study

The primary purpose is to evaluate Micro-courseware's effectiveness in enhancing teacher education at FUE Zaria by assessing its impact on student outcomes and teaching practices.

Specific Objectives

1. Examine Micro-courseware implementation within teacher education at FUE Zaria.
2. Assess its effectiveness in improving student engagement and academic performance.
3. Identify perceived benefits and challenges from both students' and lecturers' perspectives.
4. Provide practical recommendations for successful integration into curricula.

Research Questions

1. How is Micro-courseware implemented within teacher education at FUE Zaria?
2. In what ways does the implementation of Micro-courseware enhance student engagement and academic performance?
3. What are the perceived benefits and challenges of Micro-courseware from the

perspectives of both students and lecturers?

4. What practical recommendations can be made for successfully integrating Micro-courseware into the curriculum?

Literature Review

Micro-courseware, defined as small, focused educational modules delivered digitally, significantly enhances learning experiences by providing targeted content in an accessible format (Zheng, Long, Zhong, & Gyasi, 2022). Micro-courseware is designed to facilitate effective learning by incorporating various pedagogical strategies, making it a valuable tool in modern education. The key characteristics of Micro-courseware include:

1. **Modular Structure**: Micro-courseware is organized into manageable units that focus on specific learning objectives. This modular design allows learners to engage with content incrementally, making it easier to digest complex information and track progress over time (Hew & Cheung, 2014). Each module typically addresses a particular topic or skill, enabling students to concentrate on one aspect of their learning journey at a time.
2. **Multimedia Elements**: To create engaging and interactive learning experiences, Micro-courseware incorporates various multimedia elements, such as videos, animations, infographics, and interactive quizzes. By integrating visual and auditory stimuli, Micro-courseware can enhance comprehension and retention of information.
3. **Personalization**: One of the most significant advantages of Micro-courseware is its ability to offer personalized learning experiences tailored to individual needs. Students can progress through the material at their own pace, allowing them to spend more time on challenging concepts while quickly moving through areas they already understand (Hew & Cheung, 2014). This personalization fosters a sense of ownership over the learning process and can lead to improved academic outcomes.
4. **Accessibility**: Micro-courseware is designed for easy access across various devices, including computers, tablets, and smartphones. This flexibility ensures that learners can engage with content anytime and anywhere, breaking down geographical and temporal barriers to education (Giannakos, Jaccheri, & Krogstie, 2021). Such accessibility is particularly crucial in regions where traditional educational resources may be limited or inconsistent.
5. **Formative Assessment**: Formative assessments like quizzes and interactive tasks in Micro-courseware enable continuous monitoring of student progress and understanding. These assessments offer immediate feedback, empowering learners to identify areas for improvement and adapt their study strategies accordingly (Hew & Cheung, 2014). This ongoing evaluation helps educators track student performance and adapt instructional approaches as needed.

Micro-courseware represents a transformative approach to education by leveraging technology to create engaging, personalized, and accessible learning experiences. Its modular structure, multimedia elements, focus on personalization, accessibility across devices, and incorporation of formative assessments make it an effective tool for enhancing educational outcomes in diverse learning environments. As educational institutions increasingly integrate technology

into their curricula, Micro-courseware stands out as a promising solution for addressing the challenges faced by both educators and students in today's rapidly evolving educational landscape (Cheung, 2014).

Theoretical Framework

The integration of Micro-courseware is grounded in constructivist learning theory and the technology acceptance model.

The theory suggests that learners learn by actively creating knowledge through their experiences (Jonassen, 2021). Micro-courseware encourages participation through interactive features.

The model describes how users decide to use technology by considering its usefulness and ease of use (Davis, 1989). In this scenario, the acceptance of both teachers and students depends on how they view the technology (Teo, 2011).

Previous Studies on Micro-courseware Effectiveness

Numerous studies have highlighted Micro-courseware's effectiveness. Hew and Cheung (2014) conducted a comprehensive analysis that demonstrated significant improvements in student engagement when utilizing Micro-courseware. The research by Hew and Cheung (2014) indicated that students who interacted with Micro-courseware reported higher levels of interest and motivation in their learning processes, leading to more active participation in classroom activities. This finding highlights how Micro-courseware can change passive learning settings into engaging, interactive experiences that improve understanding and memory retention. Giannakos et al. (2021) further reinforced the positive impact of Micro-courseware by reporting increased satisfaction among students compared to traditional instructional methods. Giannakos et al. (2021) revealed that students appreciated the flexibility and accessibility provided by Micro-courseware, enabling them to learn at their own pace and review challenging content as necessary. This enhanced satisfaction not only contributes to a more enjoyable learning experience but also correlates with improved academic performance, as satisfied learners are more likely to engage deeply with the material. In a similar vein, Zheng et al. (2022) conducted a meta-analysis that synthesized findings from multiple studies, revealing significant positive effects of Micro-courseware on academic performance across various subjects. Zheng et al. (2022) highlighted those students utilizing Micro-courseware showed higher test scores and improved overall academic outcomes compared to students under traditional instruction. This evidence suggests that Micro-courseware can effectively bridge learning gaps and provide targeted support for students, ultimately leading to enhanced educational attainment.

Thus, the body of research surrounding Micro-courseware illustrates its multifaceted benefits in education, including increased student engagement, higher satisfaction levels, and improved academic performance. The results support the wider implementation of Micro-courseware as an effective solution for contemporary educational obstacles, especially in situations where traditional teaching approaches may be inadequate. Integrating Micro-courseware into curricula offers a promising way for educational institutions to enhance student success and engagement in diverse learning environments as they strive for innovation.

Challenges Faced in Implementation

Despite the well-documented advantages associated with the integration of technology in

educational settings, numerous challenges persist that can impede effective implementation. These challenges can be categorized as follows:

1. **Technological Barriers**: A significant obstacle is the limited access to reliable internet connectivity, which can severely restrict the ability of both educators and students to engage in digital learning environments. This issue is particularly pronounced in rural or underprivileged areas, where infrastructure may be inadequate. Adedoyin and Soykan (2020) highlight that without consistent and dependable internet access, the potential benefits of technological integration remain largely unfulfilled.
2. **Resistance from Educators**: Another critical challenge arises from the resistance exhibited by some educators towards adopting new technological methodologies. Many lecturers may harbour a preference for traditional pedagogical approaches, rooted in established practices and familiarity. Furthermore, a lack of confidence in utilizing new technologies can exacerbate this resistance, leading to a reluctance to innovate or adapt. Teo (2011) underscores that addressing these concerns is essential for fostering a more conducive environment for technological integration in teaching.
3. **Instructional Design Challenges**: The development of high-quality online learning modules presents its own set of complexities. Crafting effective instructional materials that are engaging and pedagogically sound demands significant time, expertise, and resources. Hew and Cheung (2014) assert that the intricacies involved in instructional design can deter educators from fully embracing technology, as they may feel ill-equipped to create content that meets the diverse needs of learners.
4. **Lack of Institutional Support**: The successful implementation of technology in education is heavily contingent upon robust institutional support. This includes not only the provision of necessary training for educators but also the allocation of adequate resources to facilitate the transition to technology-enhanced learning environments. Adedoyin and Soykan (2020) emphasize that without institutional commitment and backing, initiatives aimed at integrating technology into educational frameworks are likely to falter.

While the potential benefits of technology in education are significant, these challenges must be systematically addressed to ensure effective implementation and maximize the advantages offered by technological advancements.

Methodology

Research Design

A case study approach was employed due to its suitability for exploring complex phenomena within real-life contexts (Yin, 2018). This qualitative design allows an in-depth examination of Micro-courseware implementation at FUE Zaria.

Participants

a) **Students**: This study includes 150 students from various levels (NCE I, II, and III) enrolled in teacher education programs at FUE Zaria. This diverse group allows for a thorough exploration of how Micro-courseware influences student engagement and academic performance throughout different stages of their education.

b) **Lecturers**: The population for the lecturers component includes 20 lecturers who have experience with Micro-

courseware, selected from various departments within the teacher education programme

Sampling

A stratified random sampling method was used to guarantee representation across all academic levels among the students. This approach enables a more detailed analysis of how Micro-courseware affects students at various points in their educational paths. A purposeful sampling technique was applied for the lecturers to select those who have actively utilized Micro-courseware in their teaching. This choice ensures that participants have the relevant insights and experiences essential for understanding the implementation and influence of Micro-courseware.

Sample Size

A sample of 150 students was chosen to provide adequate statistical power to detect notable differences in both engagement and performance. For the lecturers, a sample of 20 was selected to facilitate in-depth qualitative analysis while maintaining a manageable data collection and analysis process. This sample size is sufficient to capture a range of perspectives and experiences related to the benefits and challenges associated with Micro-courseware.

Quantitative data from surveys were analyzed using descriptive statistics to summarize the key findings. This included calculating measures such as means, percentages, and frequency distributions to provide a clear overview of the data collected.

Findings

The analysis of the effectiveness of Micro-courseware in enhancing teacher education at the Federal University of Education, Zaria, was conducted using descriptive statistics. This approach provides a clear summary of the data collected from surveys, interviews, and classroom observations involving 150 students and 20 lecturers. The analysis focuses on key metrics such as mean scores, percentages, and frequency distributions to illustrate the impact of Micro-courseware on student engagement and academic performance.

Student Performance

The performance of students before and after the implementation of Micro-courseware was evaluated through test scores. The results are summarized in Table 1.

***Table 1**: Performance of students before and after implementation of Micro-courseware*

Performance Metric	Before Implementation	After Implementation	Change (%)
Mean Test Score	75%	90	+20%
Percentage Below 70%	30%	10	-20%

- **Mean Test Scores**: The average test scores increased from **75%** to **90%**, indicating a significant improvement in overall academic performance following the introduction of Micro-courseware.
- **Score Distribution**: The percentage of students scoring below **70%** decreased from **30%** to **10%,** highlighting a shift towards higher academic achievement among students.

The findings from this study illustrate the transformative potential of Micro-courseware in enhancing teacher education at the Federal University of Education, Zaria. The significant increase in mean test scores from **75% to 90%**, along with a reduction in the percentage of students scoring below **70%**, underscores the effectiveness of Micro-courseware as an educational tool. This aligns with existing literature that emphasizes technology's role in improving academic performance through personalized learning experiences (Zheng et al., 2022).

Student Engagement

The impact of Micro-courseware on student engagement was assessed through survey responses and observational data. The findings are presented in Table 2.

***Table 2**: The impact of Micro-courseware on student engagement.*

Engagement Metric	Before Implementation	After Implementation
Active Participation in Class	50%	75%
Students Reporting Engagement	82%	N/A

- **Engagement Levels**: Observational data indicated that active participation in class discussions rose significantly from **50%** to **75%** after implementing Micro-courseware.
- **Survey Responses**: A substantial **82%** of students reported that Micro-courseware made learning more engaging and accessible.

The increase in active participation from 50% to 75% highlights that Micro-courseware significantly enhances academic performance while also creating a more engaging learning environment. This aligns with constructivist theories advocating for interactive learning experiences, as noted by Jonassen (2021). Furthermore, feedback reveals that 82% of students found Micro-courseware engaging, indicating its effectiveness in capturing student interest and fostering active learning. This observation corroborates previous studies that emphasize how technology can transform passive learning into dynamic educational experiences (Hew & Cheung, 2014).

Satisfaction with Micro-courseware

Student satisfaction with Micro-courseware was gauged through a satisfaction survey, summarized in Table 3.

Table 3: Student satisfaction with Micro-courseware usage.

Satisfaction Rating	Percentage of Students
Very Satisfied	45%
Satisfied	40%
Neutral	10%
Dissatisfied	5%

- **Satisfaction Ratings**: The survey revealed that a combined total of 85% of students expressed satisfaction with the Micro-courseware format, indicating high levels of approval.
- **Feedback Themes**: Qualitative feedback highlighted key themes such as flexibility, ease of access, and improved understanding of complex topics.

The high satisfaction ratings—wherein a combined total of **85%** expressed contentment with the Micro-courseware format—demonstrate its acceptance among students. Such satisfaction is crucial as it correlates with increased motivation and engagement, which are essential for effective learning outcomes (Giannakos et al., 2021). Students appreciated the flexibility offered by Micro-courseware, allowing them to learn at their own pace and revisit challenging content as needed. This personalization is vital for accommodating diverse learning styles and needs within the classroom.

Challenges Identified

Despite the positive outcomes, several challenges were reported by both students and lecturers. These challenges are summarized in Table 4.

Table 4: Challenges of Micro-courseware usage

Challenge Category	Percentage Reporting Issues
Technological Barriers	40%
Resistance to Change	30%

- **Technological Barriers:** Approximately 40% of students indicated issues with Internet connectivity affecting their ability to consistently access Micro-courseware.
- **Resistance to Change:** Feedback from lecturers suggested that about 30% were hesitant to adopt new technologies due to comfort with traditional teaching methods.

Despite these positive outcomes, challenges related to technological barriers and resistance from educators cannot be overlooked. The reported issues with internet connectivity highlight a significant obstacle in implementing technology-enhanced learning environments, particularly in regions where infrastructure is lacking (Adedoyin & Soykan, 2020). Furthermore, resistance from educators may stem from a lack of confidence or familiarity with new technologies. Addressing these concerns is essential for fostering an environment conducive to innovation in teaching practices (Teo, 2011).

Recommendations

To maximize the benefits of Micro-courseware in teacher education, several recommendations emerge from this study:

1. **Infrastructure Improvement**: Institutions should invest in reliable Internet connectivity and technological resources to ensure all students have access to digital learning tools.
2. **Professional Development Programs**: Ongoing training for educators on utilizing technology effectively can alleviate resistance and enhance their confidence in adopting new methodologies.
3. **Continuous Feedback Mechanisms**: Establishing channels for ongoing feedback from both students and educators can help

identify challenges early on and adapt strategies accordingly.

4. **Curriculum Integration Strategies**: Developing clear guidelines for integrating Micro-courseware into existing curricula can facilitate smoother transitions and enhance overall educational practices.

In conclusion, this study demonstrates that Micro-courseware has the potential to significantly enhance teacher education at FUE Zaria by improving academic performance and student engagement while also highlighting areas for further support and development. As educational institutions continue to navigate the integration of technology into teaching practices, findings from this research provide valuable insights into effective strategies for fostering successful educational outcomes.

Limitations of the Study While valuable insights were obtained from this study:

a. Reliance on self-reported data may introduce bias.
b. Conducting research solely within one institution limits generalizability; future studies should encompass diverse contexts.

Conclusion

This study evaluated Micro-courseware's effectiveness in enhancing teacher education at FUE Zaria with key findings indicating high levels of student satisfaction alongside significant improvements in academic performance metrics while identifying unique challenges related to technological barriers and resistance among educators.

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Effect Of Educational Games On Teaching Entrepreneurial Values Among Home Economics Students In Upper Basic Schools In Zaria Education Zone, Kaduna State

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This study investigated the effect of educational games on teaching entrepreneurial values among home economics students in upper basic schools in Zaria Educational Zone of Kaduna State. A quasi-experimental design was used, involving 120 home economics students randomly assigned to experimental and control groups after a pre-test categorization test. The experimental group was taught entrepreneurial values using educational games, while the control group received traditional instruction. Data were collected using the Home Economics Achievement Test (HEAT). Data was analysis using mean, standard deviation and t-test. Results showed that students in the experimental group demonstrated a significant improvement in entrepreneurial values compared to the control group. The study concluded that educational games are an effective teaching strategy for promoting entrepreneurial values among home economics students. The findings also reveal the gender friendliness of educational games in teaching entrepreneurial values. The implications of the findings were highlighted and recommendations were made.

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Introduction

The development of entrepreneurial skills among students has become a pressing concern in Nigeria's education sector. The National Education Policy (2013) emphasizes the need for entrepreneurship education to equip students with the skills required to succeed in the 21st-century economy. Home Economics, as a subject, plays a vital role in fostering entrepreneurial values and skills among students.

The integration of home economics and entrepreneurial values provides a comprehensive foundation for success (Chua,2018). Home economics equips individuals with essential skills such as meal planning, household management, and personal finance (Oladokun,2020). Entrepreneurial values, including innovation, self-reliance, and resilience, empower individuals to take calculated risks and adapt to change (Uduafemhe,2023).

With a combination of these two concepts, individuals can develop innovative solutions to everyday problems, apply their knowledge to start and run a successful business, and cultivate essential skills for the modern workforce. The integration of home economics and entrepreneurial values fosters a strong work ethic, a willingness to take calculated risks, and a passion for lifelong learning (Bae., Qian, Miao and Fiet, 2014).

This approach offers a unique pathway to success, enabling individuals to navigate the complexities of modern life with confidence and competence. By embracing the integration of home economics and entrepreneurial values, individuals can unlock their full potential and achieve their goals.

Entrepreneurship education has been recognized globally as a crucial driver of economic growth and development (Global Entrpreneurship Monitor,GEM, 2019). In Nigeria, the government has initiated various programs to promote entrepreneurship among youths (Federal Ministry of Education, 2018). However, despite these efforts, the country still faces significant challenges in terms of unemployment and economic stagnation.

In Zaria Education Zone, Kaduna State, the need for entrepreneurship education is particularly acute. The zone has been identified as one of the areas with high levels of poverty and unemployment (Kaduna State Government, 2020). Furthermore, gender disparities in education and economic opportunities persist, with females facing significant barriers to entrepreneurship (Ogunyemi, 2014).

Research has shown that traditional teaching methods have limitations in developing entrepreneurial skills among students (Kolb, 1984). The current teaching methods in Home Economics focus primarily on theoretical knowledge, neglecting practical skills and experiential learning. This gap has resulted in students lacking the necessary skills to start and manage their own businesses. Moreover, gender stereotypes and biases in education have hindered females' participation in entrepreneurship (Adeyemo et al., 2021).

Despite the potential benefits of educational games in enhancing learning outcomes, their application in teaching entrepreneurial values among home economics students remains largely underexplored.

To address this challenge, innovative teaching methods such as educational games can be employed to enhance entrepreneurial skills among Home Economics students (Wouters et al., 2013). Educational games have been shown to improve learning outcomes, increase student engagement, and develop problem-solving skills (Gee, 2013).

This study aims to investigate the effect of educational games on teaching entrepreneurial values among Home Economics students in Upper Basic Schools in Zaria Education Zone, Kaduna State.

Purpose of the study

The purpose of this study is to investigate the effect of educational games on teaching entrepreneurial values among Home Economics students, particularly females, in Upper Basic Schools in Zaria Education Zone, Kaduna State.

Specifically, is set to:

1. Determine the cognitive level of upper basic students taught entrepreneurial values using education games and those taught with conventional lecture method in Zaria Educational Zone in Kaduna State, Nigeria.
2. Determine whether gender affects the cognitive levels of upper basic students taught entrepreneurial values using education games.

Research Question

Two research questions were posed for the study:

1. What is the difference in the cognitive level of upper basic students taught entrepreneurial values using educational games and those taught with conventional lecture method in Zaria Educational Zone in Kaduna State, Nigeria?
2. What is the difference between the cognitive level of male and female upper basic students taught entrepreneurial

values using educational games and those taught with conventional lecture method in Zaria Educational Zone in Kaduna State ,Nigeria?

Research Hypotheses

Arising from the research questions, the following two null hypotheses were set at P< 0.05:

1. There is no significant difference in the cognitive level of upper basic students taught entrepreneurial values using educational games and those taught with conventional lecture method in Zaria Educational Zone in Kaduna State ,Nigeria.
2. There is no significant difference between the cognitive level of male and female upper basic students taught entrepreneurial values using educational games and those taught with conventional lecture method in Zaria Educational Zone in Kaduna State ,Nigeria.

Methodology

Research Design

A Quasi-experimental design, Pre-test, post-test control group design was used for the study, since there was no randomization of subjects into groups. Thus, intact groups, which were already organized into classes, were used.

Population

The population for this study consists of Home Economics students in Upper Basic Schools in Zaria Education Zone, Kaduna State. Zaria education zone is made up of 100 schools with a population of about 30,000 students*. The predominance of the students offering home economics were female with few males in the select population.

Data from Ministry. of Education, Zaria Education Zone.

Sample and Sampling Technique

The study was conducted using 120 students (60 treatment group, 60 control group) from 6 Upper Basic schools selected using stratified random sampling

Instrument for Data Collection

One instrument was used for the study. This was the Home Economics Achievement Test (HEAT). This consist of 20 multiple and short answer test item questions carefully drawn a pool of entrepreneurship and home economics questions for upper basic instructional test and from the investigators design who is also a specialist in home economics.

Validation and reliability of research instrument

Before administering the HEAT, they were subjected to content and face validity by experts in home economics and entrepreneurship education to ascertain its appropriateness. The reliability coefficient from a pilot study conducted outside the zone of study was computed using Pearson's product moment correlation method and the value obtained was found to be r= 0.86. This indicate that the test was reliable and as such it would test what it was out to test.

Ethical Considerations

Informed consent was obtained from parties to be involved in this study that is purely for academic purpose and permission was granted as appropriate.

Pre-Test Session

Prior to commencement of the study, the students were subjected to a pre-test session to determine the equivalence of the group.

Data Collection Procedure

The study began with the administration of the Home Economics Achievement Test (HEAT) to both the treatment and control

groups. This initial assessment established a baseline for the participants' knowledge. Next, the treatment group engaged in educational games for a period of six weeks, while the control group did not receive any intervention. Following the six-week period, the EKT was administered again to both groups. This final assessment allowed researchers to compare the knowledge retention and progress of the treatment group, who had participated in the educational games, with the control group, who had not received any intervention.

Method of Data Analysis

The data was analyzed using mean, standard deviation and t-test.

Results

Analysis of Answers to Research Questions

Research Question 1: What is the difference in the cognitive level of upper basic students taught entrepreneurial values using educational games and those taught with conventional lecture method in Zaria Educational Zone in Kaduna State ,Nigeria?

Table 1: Descriptive Statistics on the Cognitive Level of Upper Basic(JSS) Students Taught Entrepreneurial Values Using Educational Games and those Taught with Conventional(Lecture) Methods in Zaria Educational Zone, Kaduna State,Nigeria

Treatment Groups	N	Mean	S.D
Educational Game	60	68.1833	7.69
Lecture Method	60	39.3000	7.41

Table 1 shows the difference in the cognitive level of upper basic students taught entrepreneurial values using educational games and those taught with conventional method in Zaria Educational Zone, Kaduna State, An examination of the groups indicate that the post-test scores of students taught entrepreneurial values using educational games are higher than those taught using conventional method.

Research Question 2: What is the difference between the cognitive level of male and female upper basic students taught entrepreneurial values using educational games and those taught with conventional lecture method in Zaria Educational Zone in Kaduna State, Nigeria?

Table 2: Descriptive Statistics on the Cognitive Level of Male and Female Upper Basic(JSS) Students Taught Entrepreneurial Values Using Educational Games and those Taught with Conventional(Lecture) Methods in Zaria Educational Zone, Kaduna State, Nigeria

Treatment Groups	N	Mean	S.D
Male	30	67.833	7.79
Female	30	68.533	7.71

Test of Hypotheses

H_{01} : There is no significant difference in the cognitive level of upper basic students taught entrepreneurial values using educational games and those taught with conventional lecture method in Zaria Educational Zone in Kaduna State, Nigeria.

Table 3: Independent t-test sample statistics on Mean Cognitive Level of Experimental and Control Groups

Treatment Groups	N	Mean	S.D	Df	t-cal	t-crit	Sig(p)
Educational Games	60	68.183	7.69	118	20.08	1.96	0.000
Conventional Method	60	39.300	7.40				

Calculated P< 0.05, calculated t > 196 at Df=118

Table 3 shows that significant difference existed in the cognitive level of upper basic students taught entrepreneurial values using educational games and those taught with conventional method in Zaria Educational Zone, kaduna state, Nigeria. This is due to the fact that the calculated t-value of 20.08 is higher than the 1.96 t critical value at Df 118. Therefore, the null hypothesis is rejected.

H_{02} : There is no significant difference between the cognitive level of male and female upper basic students taught entrepreneurial values using educational games and those taught with conventional lecture method in Zaria Educational Zone in Kaduna State ,Nigeria.

Table 4: Independent t-test sample statistics on Mean Cognitive Level of Male and Female Experimental Groups

Treatment Groups	N	Mean	S.D	Df	t-cal	t-crit	Sig(p)
Male	30	67.833	7.79	58	0.350	1.96	0.728
Female	30	68.533	7.70				

Calculated P< 0.05, calculated t > 196 at Df=118

Table 4 shows that there is no significant difference between the cognition level of male and female taught entrepreneurial values using educational games in Zaria Educational Zone in Kaduna State ,Nigeria. This is due to the fact that the calculated t-value of 20.08 is higher than the 1.96 t critical value at Df 118. Therefore, the null hypothesis is retained

Discussion

One of the major goal of education is to enhance academic performance through acquisition of skills and knowledge that will add value to learners in their career progression. In this study we report among other considered variables the effect of educational games on teaching entrepreneurial values among home economics students in upper basic schools in Zaria Education Zone, Kaduna state

The impact of educational games on the teaching entrepreneurial values among home economics students in our present study, is on a positive direction implying a very strong potential for cognitive level following the use of ICT. These findings and indeed in the literature is not surprising judging from what educational games brings to the table when it comes to facilitating teaching and learning. Daniel *et al.*,(2024) has shown that educational game-based learning effectively enhances students' entrepreneurial competence, particularly in areas like generating ideas, managing resources and taking action, while also boosting self-efficacy. It also helps to improve students' and teachers' capacity.

Research on the cognitive level of students taught with entrepreneurial values using educational games versus conventional lecture methods in Zaria Educational Zone is scarce. However, a study conducted in South-East Nigeria provides valuable insights into the effectiveness of business game learning approaches in developing entrepreneurial mindsets among business education students [1].

The study found that business game learning approaches are highly effective in developing an entrepreneurial mindset in students, with a grand mean rating of 3.29 out of 4. These approaches provide direct experiences, stimulate imaginative thinking, encourage independent thinking and analysis, develop social interaction skills, and present real-world challenges. Students valued these approaches for their practical and engaging nature, which helped build confidence, creativity, and problem-solving skills. The study highlights the importance of business game learning in entrepreneurship education, providing a comprehensive and interactive learning experience that prepares students for real-world challenges. Additionally, the study revealed no significant difference in the mean responses of 200-level and 300-level students on the extent to which problem-based learning approaches are utilized for developing entrepreneurial mindset (Ebere and Ndidi,2022). Its findings suggest that educational games can be an effective tool for teaching entrepreneurial values and promoting cognitive development in students. Findings is consistent with present study.

As to the question of gender and its impact on academic achievement, the literature are at variance with each other as males and females prefer to learn differently. In a study on Gender differences in learning preferences among participants of serious business games, Garber et al.,(2017) found no gender bias between sexes. Feraras *et al.*,(2019) in a study on Gender and Learning Outcomes in Entrepreneurship Education found male to perform significantly better than the female Also in a recent study by Makudza *et al.*,(2024) on Driving entrepreneurship through gender-moderated entrepreneurial mindset among tertiary students, it was found that gender stereotype is still rife within the entrepreneurship arena and cultural determinants and gender roles influence females' uptake of entrepreneurial roles. The results of this study indicate that upper basic male students taught entrepreneurial values using educational games in Zaria Educational Zone performed equally like their female counterparts on cognitive achievement tests (HEAT). However, the study also reveals that educational games significantly improved cognitive achievement for both male and female students. This supports the notion that experiential learning approaches, such as educational games, can enhance entrepreneurship education outcomes (Gee, 2013). In a review conducted by Bagheri *et al.*, (2020) found limited literature on the interrelationship between gamification and students' entrepreneurship learning outcomes (ELOs). The majority of these studies suggested a positive association between gamification and students' ELOs.

The significant interaction effect between gender and treatment suggests that educational

games may have a more pronounced effect on male students' cognitive achievement. This could be attributed to differences in learning styles and preferences between male and female (Raj and Shankar, 2019).

Conclusion

In conclusion, the study has demonstrated the efficacy of educational games in teaching entrepreneurial values to home economics students in upper basic schools.

The use of educational games has been shown to be a highly effective teaching strategy, capable of promoting entrepreneurial values such as creativity, innovation, risk-taking, and self-reliance among home economics students. Incorporating educational games into their teaching practices, home economics educators can create a more engaging, interactive, and immersive learning environment that fosters the development of entrepreneurial values.It also shows that the use of educational games as a medium of instruction is gender friendly. Moreover, the study's findings suggest that educational games can be a valuable tool for addressing the challenges of entrepreneurship education in Nigeria.

The findings of this research have far-reaching implications for home economics educators, policymakers, and stakeholders seeking innovative approaches to entrepreneurship education.

By leveraging the power of educational games, educators can help to equip home economics students with the knowledge, skills, and attitudes necessary to succeed as entrepreneurs in the 21st century.

Recommendations

In light of these findings, it is recommended that:

1. Curriculum planners should integrate educational games into entrepreneurship education curriculum
2. Games development should be tailored to specific learning objectives and gender needs by home economics teachers.
3. Home economics educators and policymakers should prioritize the development and implementation of educational games as a teaching strategy for promoting entrepreneurial values.
4. Instructional strategies should be adapted to address gender differences. and promote gender-sensitive entrepreneurship education programs.
5. More topics should be tested with educational games so as to compare findings.

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ADOPTION LEVELS OF INFORMATION AND COMMUNICATION TECHNOLOGY FACILITIES IN TEACHING SECONDARY SACHOOLS AGRICULTURAL SCIENCE IN NORTHWEST NIGERIA

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This study was conducted to explore the adoption levels of Information and Communication Technology facilities in teaching and learning in Senior Secondary Schools Agricultural Science in Northwest, Nigeria. Four objectives and four hypotheses guided the study. Survey research design was adopted while the population of 7976, which comprised of all Agricultural Science teachers in the zone, from where 367 teachers were sampled for assessment. The instrument used to collect data was a closed structured questionnaire which was validated with reliability coefficient of 0.96. The researchers administered the instrument personally and collected back after two weeks. Of 367 administered, 326 (88.83 %) were recovered. A five-point rating scale was adopted to assess each item on the instrument. The mean of each item was calculated while benchmark of 3.00 determined decision of acceptable and rejection of the items. Data was subjected to Analysis of Variance ($p \leq 0.05$)and used to test the study hypotheses. The results showed that ICT facilities were available (3.440) and adequate (3.167) but were neither functional (2.760) nor utilized (2.846) for teaching and learning of Agricultural Science in Senior Secondary Schools in Northwest Nigeria. It was concluded that ICT facilities were not functional and utilized for teaching Agricultural Science in the study area. Hence the study recommended that provision of up-to-date ICT facilities, create enabling environment and training of the teachers by both government and non-governmental organization were imperative to improve the situation in the study area.

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Introduction

Information and Communication Technology (ICT) is seen as the handling, processing and sharing of text, images, graphs and instruction information through electronic and communication devices such as computer, cameras, telephones, internet, software and hardware (Apagu and Wakili, 2015). Ejiofor, *et. al*. (2018) defined ICT as tools or resources that could be used to process, preserve, access, retrieve, manage, and disseminate information with relative ease. There are diverse set of technological tools and resources adopted to share, create, disseminate, preserve and manage information to both sharers and receivers (Hamisu, *et. al*., 2024). The application and expansion of ICT across wide areas of human endeavours including educational institutions came with the main intention of improving the teaching and learning environment (Omere, *et. al.*, 2020). The tools according to the authors are considered imperative in the quality of education for all because of its

unique ability to bring the world together easily.

Technology is rapidly emerging as an instrument of national stability and international harmony. The more technologically advanced a nation is the more stable her politics and social life become. ICT application in teaching and learning facilitated feedback between the teacher and the students (Bakare and Olaniyi, 2017). Omere, *et. al.,* (2020) opined that ICT adoption in teaching encouraged students' masteryof teaching materials independently, choice of the pace of work, repetition, not cleared materials and track their progress personally or individually. Such adoption also simplifies abstract concepts through relevant examples by using software, hardware and other facilities.

Integrating ICT into delivery process of Agricultural Science can increase the effectiveness of instruction, broaden knowledge and ensure retention of skill acquired (Omere*et. al.,* 2020). The teaching of this subject at secondary schools with ICT facilities will boost the interest of the pupils in their choice of this subject as a career in the future. Modern ICT can help increase communication, improve active participation, information dissemination and knowledge/skill sharing when properly applied in instruction (Chaudhuri and Kendall, 2021). Meanwhile, information and better communication are critical requirements for sustainable agricultural development. The ability to use these tools effectively has become an essential part of everybody's education.

ICT facilities used in the teaching and learning process in Vocational courses "Agricultural Science not exempted" include but not limited to computer, radio, television, mobile phone, overhead projector, optical fibres, fax machines, CD-Rom, VHF, internet, electronic notice board, smart board, slide and slides projectors, digital multimedia, Video/VCD machine, tablets among others (Khan, *et al.,* 2012; FRN, 2013; Apagu and Wakili, 2015; Sallau, 2022). The use of ICT in education is a recent trend for students to gain prior knowledge ahead of the classroom situation, which enhance teaching and learning. Knowing fully well that technology affects the way the entire world population reasons, associates, learns and communicates.

ICT put education at the finger tip of students but a lot of factors in Nigeria have affected the effective utilization of these resources in teaching Agricultural Science and related subjects in our secondary schools. Increasing trend of the utilization of ICT tools in classroom work across the globe has become the order of the day. The adoption of ICT devices in instruction makes information dissemination more efficient as well as boost productivity, makes both teachers and learners more active in instruction and improve competency acquisition in all aspect of learning.

Despite the positive influence of ICT facilities utilization in Education, it has not been embraced and integrated seriously in our education sector. The traditional approaches of chalkboard and textbook still prevail in Nigeria Senior Secondary Schools (Sallau, 2022). Also, observations of the researchers have shown that there are no functional ICT facilities in most secondary schools in Northwest Zone and this hampers the teachers' application of such devices in teaching and learning. Lack of adequate ICT facilities, technical know how, irregular power supply and inadequate funding are other set of obstacle hampering effective utilization of ICT facilities in teaching and learning of Agricultural Science in secondary schools (Onwunali *et al*., 2024). Hence the

need to establish the availability, adequacy, functionality and utilization of ICT facilities in teaching of Agricultural Science in public Senior Secondary Schools in Northwest Geo-political Zone of Nigeria.

Objectives of the Study

i. Ascertain the availability of ICT facilities for teaching Agricultural Science in Senior Secondary Schools in Northwest Nigeria,
ii. Determine the adequacy of ICT facilities for teaching Agricultural Science in Senior Secondary Schools in the study area,
iii. Assess the functionality of ICT facilities for teaching Agricultural Science in Senior Secondary Schools in the study area and
iv. Identify the utilization of ICT facilities for teaching Agricultural Science in Senior Secondary Schools in the study area.

Hypotheses of the Study

1. There are no significant mean differences in the availability of ICT facilities for teaching of Agricultural Science at Senior Secondary School in Northwest Nigeria.
2. There are no significant mean differences in the adequacy of ICT facilities for teaching of Agricultural Science at Senior Secondary School in the study area.
3. There are no significant mean differences in the functionality of ICT facilities for teaching of Agricultural Science at Senior Secondary School in the study area.
4. There are no significant mean differences in the utilization of ICT facilities for teaching of Agricultural Science at Senior Secondary School in the study area.

Methodology

Survey research design was adopted for the study because of its suitability in covering large group. This study was carried out in the Northwest geopolitical Zone of Nigeria where Kaduna, Kano and Katsina States were selected based on convenience due to insecurity at the time of collecting the data in three (Kebbi, Sokoto and Zamfara States) of the seven state within the zone. The States three senatorial districts formed the basis for selecting respondents who are Agricultural Science teachers of Senior Secondary Schools. Population of the study was 7976 which comprised of 319 School Principal, 631 Vice Principal, 631 and 7126 number of teachers based on the states Ministry of Education. A total of 367 teachers were sampled based on Krejcie and Morgan (1970) population sample table, as follows 130 from Kaduna State, 132 in Kano while 105 were from Katsina State.

The instrument used for data collection was questionnaire tagged Information and Communication Technology Teaching Facilities Questionnaire (ICTTFQ). The instrument was developed by the researchers and was validated by three experts in Agricultural Education with two from Federal University of Education, Zaria and one from Kaduna Polytechnic, Kaduna. The instrument was also pilot tested in Zamfara State (States within the same Ggeopolitical Zone) with 20 respondents, which yielded high reliability Coefficients of 0.96using Cronbach Alpha.However, the instrument was divided into five sections; section A-E with A dwelling on bio-data of the respondents, B to E on availability, adequacy, functionality and utilization, respectively. The sections B to E were design using five point rating scale as follows,

Strongly Agreed	=	SA (5 points)
Agreed	=	A (4 points)
Undecided	=	U (3 points)
Disagreed	=	D (2 points)
and		
Strongly Disagreed	=	SD (1 point)

for Sections B, and D, While

Highly Adequate	=	HA (5 points)
Adequate	=	A (4 points)
Moderately Adequate	=	MA (3 points)
Not Adequate	=	NA (2 points)
and		
Highly Not Adequate	=	HNA (1 point)
for section C and		
Highly Utilized	=	HU (5 points)
Utilized	=	U (4 points)
Moderately Utilized	=	MU (3 points)
Not Utilized	=	NU (2 points)
Highly Not Utilized	=	HNU (1 point)

for section E.

A total of 367 questionnaire were distributed while 326 were recovered having 88.83% rate of recovery. The instrument was administered by the researchers and coordinated research assistants in the selected areas. The mean of each items were calculated with a mean of 3.00 as acceptable benchmark. Data were also subjected to Analysis of Variance (ANOVA) at 5% level of significance while means were separated withTukey HSD.

Result Presentation

The results of the study were presented considering the five hypotheses formulated.

Hypothesis One: There are no significant mean differences in the availability of ICT facilities for teaching of Agricultural Science at Senior Secondary School in Northwest Nigeria.

Table 1: ANOVA on Availability of Information and Communication Technology Facilities

Sources of Variance	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	20.170	2	10.085	40.077	0.000
Within Groups	9.814	39	0.252		
Total	29.984	41			

Considering the three states under the study, the mean scores on availability of ICT facilities for teaching Agricultural Science at Senior Secondary Schools were 3.714, 2.487 and 4.118 for Kaduna, Kano and Katsina respectively. These indicated that Katsina State has more facilities than Kaduna and Kano States. The teachers in Kaduna and Katsina States agreed to the availability of ICT facilities for teaching Agricultural Science whereas those of Kano disagreed. However, the result on Table 1 showed F ratio of 40.077 with P value of 0.000. This implied that, there are significant differences in the level of availability of ICT facilities within the study area hence the hypothesis of no significant difference is therefore rejected. The differences were contributed mainly by Kano State because of her low level of availability. The result indicated ICT facilities are available within the study area with a grand mean of 3.440.

Hypothesis Two: There are no significant mean differences in the adequacy of ICT facilities for teaching of Agricultural Science at Senior Secondary School in the study area.

Table 2: ANOVA on Adequacy of Information and Communication Technology Facilities

Sources of Variance	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	26.577	2	13.251	96.261	0.000
Within Groups	4.556	33	0.138		
Total	31.133	35			

Results (Table 2) showed mean scores of 3.125, 2.136 and 4.241 for Kaduna, Kano and Katsina States, respectively. These means showed Kaduna and Katsina States teachers agreed to the adequacy of ICT facilities compared to Kano State teachers. The result in Table 2 showed F ratio of 96.261 with P value of 0.000. This implied that, there are significant differences in the level of adequacy of ICT facilities within the study area. Therefore, the hypothesis of no significant difference was therefore rejected. Meanwhile, the differences were contributed mainly by Kano State. The result implied that these facilities were adequate in the study area having a grand mean of 3.167.

Hypothesis Three: There are no significant mean differences in the functionality of ICT facilities for teaching of Agricultural Science at Senior Secondary School in the study area.

Table 3: ANOVA on Functionality of Information and Communication Technology Facilities

Sources of Variance	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	42.124	2	21.062	70.329	0.000
Within Groups	4.081	33	0.124		
Total	46.205	35			

The means of ICT facilities functionality in the three states were 1.708, 2.325 and 4.246 for Kaduna, Kano and Katsina States, respectively. The result showed that, functionality of ICT facilities in teaching of Agricultural Science in Katsina State is better than Kaduna and Kano States. The ANOVA output of F ratio 170.329 and P value of 0.000 showed that, there are significant differences in the functionality of ICT facilities, hence the hypothesis of no significant differences was rejected. Consequently, the levels of ICT facilities functionality in teaching Agricultural Science was better in Katsina State followed by Kano State. This result implied that ICT facilities in the study area are not functional with a grand mean of 2.760.

Hypothesis Four: There are no significant mean differences in the utilization of ICT facilities for teaching of Agricultural Science at Senior Secondary School within the study area.

Table 4: ANOVA on Utilization of Information and Communication Technology Facilities

Sources of Variance	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	40.332	2	20.166	78.608	0.000
Within Groups	10.005	39	0.257		
Total	50.338	41			

The study revealed mean utilization of 1.821, 2.558 and 4.158 for Kaduna, Kano and Katsina States, respectively. The result showed that teachers of Agricultural Science in Katsina State utilize ICT facilities better in teaching the subject compared to Kaduna and Kano States due to low or lack of functionality of the resources. The output of the ANOVA have F ratio of 78.608 with P value of 0.000, indicating significant differences between the levels of ICT facilities utilization among the teachers of Agricultural Science within the study area. Hence the hypothesis of no significant differences was rejected. The finding showed low level of resources utilization for teaching Agricultural Science in the study area having recorded a grand mean of 2.846.

Discussion of Findings

The result showed that teachers of Agricultural Science in Kaduna and Katsina States agreed that ICT facilities are available for teaching while those of Kano State disagreed to the availability. The finding of the ANOVA showed there is significant difference on the level of availability of ICT facilities for teaching Agricultural Science within the zone. This implied the level of availability varied across states with some being high and some low..The finding is in agreement with the findings of Apagu and Wakili (2015) and Sallau (2022) who agreed to availability of ICT facilities for teaching and learning in Technical Colleges of Yobe State and Colleges of Education in Northeast Nigeria respectively. However, the findings of this study disagreed with Ademiluyi (2019), Belay *et al*, (2020) and Omodara *et al*, (2021) who reported that ICT facilities were not available for teaching Business Subject in Osun State, teaching and learning of Biology in secondary schools in Southern Region of Eritrea and Vocational Courses in Kano State, respectively.

The result on adequacy of ICT facilities for teaching Agricultural Science via the means showed that the resources are adequate in both Kaduna and Katsina States whereas that of Kano State showed inadequacy. However, the overall result showed that ICT facilities are adequate in the study area. The output of the second hypothesis showed that there are significant differences in the level of adequacy of these resources within Northwest zone. This result indicated variation in the level of adequacy of ICT facilities for teaching Agricultural Science in the study area. This finding agreed with the stand of Sallau (2022) who confirmed that facilities were adequate for teaching and learning Agricultural Education in COEs in Northeast Nigeria. The result disagreed with Mavellas *et al.* (2015) who reported inadequate availability of ICT facilities in Secondary Schools in Kwekwe, Zimbabwe. Also, Dambo and Umar (2018) were of the opinion that ICT facilities are

insufficient in secondary schools for teaching and learning.

Considering the means Kaduna and Kano States have low scores compared with Katsina State. Katsina facilities are functional while those of Kaduna and Kano State were not functional. Result on the functionality of ICT facilities for teaching Agricultural Science showed that ICT facilities in the study area are not functional. Their functionality may be ascribed to lack of maintenance, shortage or lack of regular sources of power to support these facilities. This is in agreement with Sibanda and Ramrathan (2017) who established low level of ICT functionality. But the result is in disagreement with the stand of Apagu and Wakili (2015) who confirmed functionality of these resources in Technical Colleges in Yobe State.

The finding showed low level of resources utilization for teaching Agricultural Science in the study area. Lack of utilization may be as a result of non-functionality, in-competency of the teachers or poor motivation to adapt and adopt these facilities. This result agreed with the stands of Atsumbe, *et al*. (2012), Onwuagboke *et al*. (2014), Ayikoye (2017), Ademiluyi (2019) and Belay *et al.* (2020) who all confirmed either no or low level of resources utilization at various level of education. On the contrary, Onu and Ezhim (2019) were of the view that the resources were slightly utilized but not for instructional delivery in Agricultural Science rather for administrative purposes.

Conclusion

Based on the findings of the study, it is concluded that ICT facilities are available and adequate in the study area for teaching Agricultural Science. On the contrary, these facilities are not functional probably because of challenging environment and low level of competencies on the part of the teachers in the application of such facilities hence they are not being utilized for teaching Agricultural Science in Senior Secondary Schools in Northwest Nigeria.

Recommendations

The following recommendations were prescribed based on the findings of the study;

- Even though ICT facilities for teaching Agricultural Science at Senior Secondary Schools in the study area were available, there is still need for state governments to continue to make provision for up-to-date resources.
- Also, the adequacy of ICT facilities for teaching Agricultural Science were established, but the need to keep expanding the quantity of these resources by Ministry of Education in the various state exist because of the population explosion being experienced in the public Senior Secondary Schools in the study area.
- Supply of regular and stable sources of power is a major factor hindering functionality of these resources; hence exploration of alternative sources of power via Non-Governmental Organisation and Parent Teachers Association (PTA) will be a better option.
- The Ministry of Education of the states within the study area should encourage training and re-training of teachers of Agricultural Science on ICT facilities to boost utilization.

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ADVANCING ACADEMIC EXCELLENCE: THE STRATEGIC IMPORTANCE OF RESEARCH DATA MANAGEMENT TOOLS IN RESEARCH WRITING AND LEARNING

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Research management tools are software applications that assist researchers in planning, tracking, and executing their research projects seamlessly as they create tasks, assign roles, and set deadlines for progress management and performance of research. This paper provides an overview of the importance of research and the significance of tools for academic research, along with examples and guidelines for readers and writers on how the tools could be used efficiently. The paper highlighted the need for every researcher to avail themselves of the opportunities of the tools in their research while identifying the proper tools and resources for data collection and viability, data quality, and analysis towards better policy formulation, improvement, dissemination, and contribution of data findings for advancement of knowledge.

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Introduction

In today's digital age, with a plethora of tools available at our fingertips, researchers can now collect and analyze data with greater ease and efficiency. Research today is dynamic as it is performed to find solutions, make decisions and identify gaps to fill which necessitate a researcher to consult different sources of information from the internet, analytics and diverse sources including videos etc. The dynamic nature of research is the application of these interactive, and media-rich research tools in every step of the research process for time saving, productivity, and provision of accurate, efficient and reliable results. This is why the use of essential research tools is crucial for every researcher while conducting their research (Blog, 2023).

The importance of significance of research is of paramount importance to every research study irrespective of fields, areas covered and its advancement and contribution towards every stakeholder that will benefit immensely during the course of the study. Research in common parlance refers to a search for knowledge. Research is a scientific and systematic investigation and search for pertinent information on a specific topic. Jonker & Pennink (2010) defined research as "a careful investigation and inquiry through a search for new facts in any branch of knowledge (Jonker & Pennink, 2010).

Similarly, Creswell (2008), defined research as a "systematized effort to gain new knowledge." This inquisitiveness is the mother of all knowledge and the method, which man employs for obtaining the knowledge of whatever the unknown, can be termed as research (Singh, 2021).

According to Barret (2022), research is a careful or diligent search; studious inquiry or examination; the collecting of information about a particular subject through the search for knowledge in an objective and systematic method for finding a solution to a problem. This systematic approach is the generalization and

formulation of a theory (Barett, 2022; Creswell, 2008). This shows that research is a contribution to the existing stock of knowledge for its advancement, and pursuit of truth with the help of study, observation, comparison and experiment.

Significance of Research

All progress is born of inquiry. Doubt is often better than overconfidence, for it leads to inquiry, and inquiry leads to invention." According to Hudson Maxim, the increased amounts of research make progress possible when it inculcates scientific and inductive thinking to promote the development of logical habits of thinking and organization in finding solutions to an identified gap (Creswell, 2008). The importance of research is the ability of a researcher to assess a problem and end with solving that problem through access to an array of essential research tools that can help simplify the research process from data collection, analysis, verification and presentation for accessibility, accurate and efficient information. When researchers leverage these tools, they can improve their work and produce more high-quality research.

Importance of Research Data Management Tools

Managing data is a daunting and challenging task. It needs careful monitoring from when the data is made until it is thrown away. When data is managed well, researchers can reduce risk and improve the usability and quality of the data. Data management tools can archive, back up, restore, search, and more. These solutions let companies manage data across multi-cloud setups. Scaling and working with data from several sources can be challenging for researchers and businesses. The use of data management tools will provide a platform to overcome challenges including, data duplication, isolation, or complex management problems (Questionpro, 2022). The significance of these tools is important to assist authors, researchers, and information seekers with sound research tools needed for their academic writing. The use of these tools is categorized into various forms and functions free and commercial:

Tremblay (2023) opined that effective research data management is a crucial component for the success of scientific investigations with a direct impact on the quality and reliability of research outcomes. It is worth noting that research data management (RDM) has grown significantly as researchers across disciplines, and fields seek to ensure reproducibility, facilitate data reuse, and acknowledge data as a piece of valuable scholarly information needed for decision-making.

According to Thomson (2024), Research Data Management (RDM) refers to practices and ways an organization stores, preserves, shares, and publishes information and data collected to enhance the research process of students and information users and for decision-making. This platform gives a researcher prompt information for the use of sound scientific data, preserves data in the short and long term in line with regulatory compliance, saves time, and resources and supports open science needed for information sharing across the globe.

Also, Bradley (2023), defined Reference data management (RDM) as the process of collecting, organizing, maintaining, and ensuring the accuracy and consistency of reference data across an organization. It also included creating standardized definitions, procedures, and guidelines for managing reference data throughout its lifecycle to ensure that data is accurate, up-to-date, and readily

available for use by researchers, students, and information users.

D'Anna, Jareborg and Jetten (2024) in their study on a research data management (RDM) community for ELIXIR posits that institutions, funding agencies and publishers are placing increasing emphasis on good research data management (RDM). They also reported that research data auditing had an overall positive effect on self-reported RDM awareness, compliance and reception for both research PIs and researchers. Researchers agreed more that Research Data Management was important to scientific reproducibility, were more aware of proper RDM, had higher RDM strength in their laboratories and were more compliant with the Data Management Plan (DMP). As researcher believed data auditing helped them to be more compliant with data deposition in the repository for their research report.

Relevance of Research Data Management (RDM) tools

RDM offers critical relevance for researchers, students and organizations, including:

a. It improves accuracy and consistency in Data Management: the use of RDM tools will ensure data remains consistent across all systems and data sets which will enhance consistency reduce error and improve data quality of information.
b. It promotes operational efficiency: the use of RDMt tools during the research process and information usage will eliminate errors through automation, reduce the need for manual use of data and handling towards saving time, and improve the efficient use of information resources.
c. Adherence to Regulatory compliance: With the use of RDM practices during information usage, students can maintain accurate data records support in line with compliance with data governance and legal standards to use accurate data.
d. Streamlined Data Integration: the use of RDM tools with standardized reference data simplifies integration across platforms and systems, making it easier for researchers, students and information users to merge data from different sources for efficient data exchanges and prompt data-driven decision-making when reporting their findings in a research report.
e. Enhances the use of data quality: By implementing a robust RDM process and strategy, researchers, students and information users can improve overall data quality through the use of accurate and consistent reference data to minimize, ensuring that businesses can rely on their data for critical decision-making.
f. Boosting the credibility of research outcomes: The transparency associated with the use of high-quality RDM tools helps researchers present their conclusions to the scientific community with results from clearly notated, repeatable experiments, supported by well-documented, verifiable data.
g. It fosters collaboration and data sharing: A well-implemented RDM tools and framework will promote collaboration between departments, data centres, and teams by providing a shared understanding of data that will enable organizations to break down data into silos and facilitate effective data sharing across the researchers, students, information users and data centres.
h. Promotion of Increased discoverability: With the proper documentation and metadata that will improve data accessibility and discoverability, researchers can easily locate, access well-managed, disseminated and use to promote increased visibility to new

research opportunities and improved scientific communication.

i. Cost Savings: The use of RDM Tools for information research will prevent duplication of effort and human and material resources including the need to recreate or recollect data. This efficiency allows more funds to be allocated to other critical aspects of research.

Types of Research Data Management Tools for Researchers

Research Data Management tools can be classified into various categories including, planning and management of research projects, literature search, data collection and analysis, reference management, editing and paraphrasing, plagiarism verification, collaboration and communication with the world. They include the following:

1. Margin Note: is a licensed commercial all-in-one reading and highlight tool available on smart devices like Mac, iPad, and iPhone for users to organize and manage large volumes of PDFs and EPUBs. The application takes notes, creates the mind map, reviews flashcards, and therefore saves time for users from switching endlessly between different applications while conducting their research (Gupta, 2023).
2. Zotero: Zotero is a license-free, easy-to-use tool application that assists researchers in collecting, organising, citing, and sharing research from various sources, including journal articles, websites, newspapers, and PDFs by providing managing bibliographic data, and related research materials (such as PDF files). The application has unique features like web browser integration, notification of retracted papers, online syncing, generation of in-text citations, and footnotes, identification and extraction of cited quotations and comments, saved as notes and bibliographies, as well as integration with the word processors Microsoft Word and LibreOffice Writer (Gupta, 2023).
3. RefWorks is a license-free web-based commercial reference management software package. It provides a platform for linking users with electronic editions of journals to which the institution's library subscribes promoting academic integrity and excellence (Wilagama, 2023).
4. EndNote is a licensed Commercial industry software tool used for collecting, curating research materials and formatting bibliographies with greater ease and control in the coordination of information resources saving researchers the tedious work of manually collecting (Wilagama, 2023).
5. Mendeley Reference Manager: is a free desktop license software used for organizing, sharing, and generating bibliographies of researchers. This tool allows researchers to create references, citations, and bibliographies in multiple journal styles with just a few clicks; stores and manages these sources for information usage (Gupta, 2023; Pandey, 2021).
6. Read cube is a license commercial desktop browser-based program used on desktop (Mac/PC), and mobile devices (iOS/Android/Kindle) for managing, annotating, accessing academic research articles, and syncing for library collections for easy accessibility and usage for diverse information users (Questionpro, 2022).
7. Docear is a license-free programme that recommends papers in full-text for download, tailored to every information needs of diverse users (Questionpro, 2022)
9. Paperpile is a licensed commercial web-based reference management integration

software for Google Chrome browser extension and plugins that searches information from Google Docs and Google Scholar based on search inquiry using the interface (Questionpro, 2022).

10. JabRef is a free open-source bibliography reference manager used for the production of BibTeX, the standard LaTeX bibliography format for journals and publishing houses. The application runs on the Java VM (version 8), on Windows, Linux, and Mac OS X. Example sources include arXiv, CiteseerX, Google Scholar, Medline, GVK, IEEEXplore, and Springer (Questionpro, 2022).
11. Content Mine is a content text mining and conversion tool that researchers can use to find, download, analyze, and extract data knowledge from tables and graphs in academic papers (Questionpro, 2022).
12. Google Cloud Platform: Google Cloud is a Cloud-based data management that provides an efficient workflow manager that binds the different components of Google Data Studio with graphical user interface analysis, dashboard creation and Google Big Query to store tabular data which could be accessed on different smart devices platform like mobile phones, computers and tablet (Questionpro, 2022)
13. Informatica PowerCenter: is an application used by researchers for the movement of data from one source to another with an enhanced data visualization interface for displaying data in graphical form with its sources (Questionpro, 2022).
14. Profisee: Profisee is a master data management software that creates and provides reliable and pertinent data for use in both business and research. Using analytics-based feedback, such as real-time governance and progress measurements, you may impose business procedures and give data stewards the authority to master data.
15. Ref-N-Write Academic Writing Tool: Ref-N-Write is a Microsoft Word add-in search and grammatical correction tool used for importing research papers from files in your computer into MS Word. This tool provides features of a text-to-voice option that helps users pick up grammatical errors and sentence structural issues (Refnwrite, 2018).
16. Publish or Perish: Publish or Perish is a software program that retrieves and analyses academic citations from Google Scholar and Microsoft Academic Search to obtain the raw citations, analyze, and present the metrics on the total number of papers citations, and citations per year for reference. This tool assists researchers with detailed search tips and additional information about the citation metrics of articles consulted and used for scientific impact factors (Department of Applied Information Systems, 2022).
17. Idea Rover: is a dissertation writing software that helps researchers to retain, organize, and evaluate assertions, ideas, and concepts for their dissertation, prepares outline-structured notes, and by saving researchers time and eliminates tedious cut-and-paste work to reduce plagiarism (Corcoran,2023).
18. iThenticate: iThenticate is a plagiarism detection software developed by Turnitin an online plagiarism checker used by researchers and academics to review, and check their manuscripts for originality, and citing of sources appropriately before journal submission and publication. This tool compares the author's submission with an extensive database of web pages, and

scholarly content before producing a similarity detection of plagiarism levels with scores and reports. With the use of this tool researchers eliminate any inadvertent instances of plagiarism contents, and other blunders in their research papers and articles (iThenticate, 2024; Gupta, 2023; Corcoran, 2023)

19. Grammarly: is a writing enhancement tool used by researchers for proofreading and spellchecking their articles for a professional outlook that saves writers/ authors a ton of time and effort used for basic spellchecking and corrections. The tools include a grammar checker, a punctuation checker, a vocabulary enhancer, and plagiarism checker tools that scan and correct articles with error-free writing from 250 types of grammar mistakes in six distinct writing genres (Grammarly, 2024; Blog, 2023).
20. Plagiarism Checker X: Plagiarism is an AI detection and similarity tool used by researchers to identify works of plagiarism and copyright infringement contents of your articles against billions of published articles and webpages across the globe over the internet. The tools provide users with documents' originality and highlights of works in reports to promote academic excellence and reduce plagiarism levels of contents with authors' own words. In order to avoid plagiarized articles authors are advised to consult plagiarism detection software and online checking tools to check their articles and text overlap with previously published material before submitting their academic essay and paper (Plagiarismcheckerx, 2024; Refnwrite, 2018).

Implementing Reference Data Management Best Practices

Implementing reference data management best practices is essential for any organization to ensure data quality, consistency, and compliance with regulatory requirements. These best practices will provide a framework for researchers, students, information users and organizations to follow, enabling them to manage reference data effectively and efficiently. For example, the banking industry faces stringent regulations and security concerns on data privacy, security, and compliance. Consequently, the practices involve the use of stricter access controls, encryption, and auditing processes compared to other industries. In an organization like the Finance department handling payment of civil servants in Nigeria, a student researching the fiscal balance of unpaid salaries of staff in salaries and measures put in place might be faced with a problem of inaccessibility to data sets regarding staff affected and this could jeopardize the research process. On the other hand, industries like healthcare and retail may prioritize data accuracy, security of patients, and consistency to support decision-making and enhance medical diagnosis and treatment experiences.

Effective research data management can contribute significantly to solving scientific problems in several ways. By implementing good RDM practices, researchers can improve the quality of the data used during the research process leading to accurate and reliable results. It can also increase research efficiency by streamlining data organization, analysis, and sharing which can enhance the impact of research outcomes and results needed for decision making.

Finally, RDM enhances the reproducibility and transparency of research results to the academic community, making it easier for other researchers to verify and build upon existing research findings to support their research report and solve scientific problems through

improved data quality, increased research efficiency and transparency.

Common Challenges in Managing Reference Data Tools

Managing reference data tools effectively presents unique challenges that can impact its use for students, researchers and information users:

a. Storage in Siloed data: Most reference data is often stored in isolated systems or departments, leading to inconsistencies and version control issues with the inability to access due to data regulations. For instance, the Coca-Cola Company has data laws that prohibit employees and guests who are not in the ingredients unit from accessing the chemical laboratory where the ingredients for Coca-Cola products are used. As a result, a student undertaking research in this area may have difficulties when performing their study.

b. Inadequate RDM tools: Many organizations rely on spreadsheets to track reference data for decision-making, and during the course of data entry, spreadsheets are prone to errors and are difficult to scale which could alter the data information.

c. Data integration complexities: it is worth noting that Reference data must be synchronized across systems, and without a proper integration process, inconsistencies may arise, increasing operational risk and reducing data reliability for use.

Conclusion

Research is an important component in any academic discipline as it provides access to appropriate research tools, techniques and foundations needed to facilitate the research process and identification of a gap, phenomena. Researchers from every discipline require access to various research tools, and software to conduct their research inquiry, analyze data, and report research findings. Effective Reference Data Management is foundational for any researcher, student and information user to maintain data consistency during the research process, and meet regulatory demands. Researchers need to keep up with data management trends and full use will help their research process smart, discoveries, breakthroughs and successful research. As data complexity and volumes grow, robust RDM practices, supported by advanced tools like Alation, Kohezion will allow researchers, students and information users and businesses to confidently manage, make better decisions, work efficiently and leverage their reference data while embracing automation aimed at driving better decisions and fosters sustainable growth.

Recommendation

To overcome the challenges of Research Data Management and promote best practices that organizations can adopt to optimize their reference data management efforts, the following is recommended:

1. Establishment of Clear Governance and Ownership: Organizations, industries, Schools, and academic libraries must identify key stakeholders, and establish a governance structure with defined, maintained and updated reference data to ensure accountability and compliance with RDM policies and procedures when using information and sharing during research processes.
2. Creation of centralized Reference data repository: With the use of a centralized repository in all institutions for libraries and information science centres, data banks will ensure consistency and ease of access when there is a need for research after a

researcher secures clearance to reduce discrepancies and data quality issues.

3. Implementation of Standardized Data Definitions, Monitoring and Procedures of Data Quality: With the development of standardized definitions, procedures, and guidelines for managing reference data throughout its lifecycle to address data quality metrics, implementation, validation processes, and identifying and correcting errors, inconsistencies through regularly review and update of reference data that is accurate and up-to-date.
4. Facilitating the collaboration and communication of Data Stewards: The collaboration and communication between data stewards, data owners, and other stakeholders like students, researchers and information users involved in reference data management will provide proper channels for feedback and sharing best practices.
5. Development of a Data Management Plan (DMP): The use of developed data management plan will help students, researchers, and information users to collect, organize, store, and share data with sets of clear goals to avoid data management issues and compliance.
6. Provision of training and support on the use of RDM Tools: With the provision of in-house, workshops and training for students, staff, researchers and information users involved in reference data management skills and techniques to be equipped with the necessary skills and knowledge to effectively carry out research, understand and adhere to RDM best practices and guidelines.

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