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Bridging the Digital Divide: Reimagining Future-Ready Higher Education Ecosystems in Africa.

BOOK OF ABSTRACTS

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Preface

The International Conference on Digital Innovation and Higher Education (ICDIHE 2026), hosted by the University of Kigali, takes place from 7 to 11 December 2026 at the Lemigo Hotel, Kigali, under the theme *Bridging the Digital Divide: Reimagining a Future-Ready Higher Education Ecosystem in Africa*.

This book brings together the **537 abstracts** submitted through the conference system, organised under the six sub-themes of the conference. Within each sub-theme the abstracts are listed in alphabetical order of title and numbered continuously, so that every abstract has one entry number in this book. The original submission number from the conference system is shown on each entry as the Abstract ID.

The total includes 26 registered delegates whose abstract title is listed but whose abstract text had not been received when this book went to print; they are marked on their entries.

Each entry gives the title, the authors, the affiliation and email address of the first author, the abstract, and, where supplied, the co-authors and keywords. Where an abstract was submitted to more than one sub-theme, it appears once, under the first of its sub-themes in the order shown in the contents. Abstracts are reproduced as submitted, with only light typographic editing; the authors remain responsible for their content. Submissions that were received more than once from the same author have been merged into a single entry.

An index of authors follows the abstracts. The programme, with the day, time and room of each presentation, is in the Conference Handbook.

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AI, Emerging Technologies and Future Learning

132 abstracts

Artificial intelligence, machine learning and other emerging technologies in teaching, assessment, curriculum and research.

1. A Study of Physics Teachers' Attitude toward Digital Simulations in Laboratory-Deficient Secondary Schools in Zaria, Kaduna State, Nigeria

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Secondary schools in developing nations face severe structural constraints in delivering practical science education due to deficient laboratory infrastructure. While digital simulations offer a scalable alternative to physical experimentation, successful deployment remains heavily dependent on instructor acceptance. This study investigated physics teachers' attitudes toward integrating digital simulations within laboratory-deficient secondary schools in the Zaria Education Zone, Kaduna State, Nigeria. Specifically, it examined the effects of perceived usefulness on teacher attitudes, the predictive capacity of these attitudes on adoption willingness, and the impact of infrastructural deficits. Utilizing a descriptive census survey design, data were collected from the entire population of physics educators (N = 39) across regional secondary schools using the validated 20-item Digital Simulation Attitude and Adoption Questionnaire (DSAAQ). Data were analyzed using descriptive statistics and linear regression modeling. Educators exhibited highly favorable attitudes toward digital tools (M = 4.61, SD = 0.55). Linear regression confirmed that perceived usefulness significantly predicted positive attitudinal shifts (β = .528, p = .001), accounting for 27.9% of attitudinal variance (R2 = .279$). Concurrently, positive attitudes significantly predicted teachers' willingness to adopt virtual modules (\beta = .453, p = .004, R2 = .205). However, a lack of technological infrastructure exerted a powerful negative effect on adoption willingness (β= -.641, p < .001), explaining 41.1% of the structural variance (R2 = .411). Although secondary school physics teachers are highly motivated and possess positive psychological orientations toward digital simulation integration, systemic infrastructure deficits act as a critical bottleneck to practical implementation.

2. A Ten-Archetype Taxonomy of GitHub Web Scraping Repositories: Classifying Open-Source Tools by Market Visibility and Technical Activity

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The web scraping tool ecosystem on GitHub contains thousands of repositories, yet no systematic, data-driven framework has previously been applied to classify these tools simultaneously by community adoption and collaborative development activity. This paper introduces a ten-archetype taxonomy of 5,582 GitHub web scraping repositories, derived from independent K-means++ clustering of two theoretically motivated feature sets. The Market Success dimension comprises Stars, Forks, Watchers, and Releases. The Technical Activity dimension comprises Commits, Pull Requests, Issues, and Contributors. A twelve-stage preprocessing pipeline was applied before clustering, including Winsorization at the 99th percentile, Box-Cox transformation, and Variance Inflation Factor analysis. Optimal cluster counts were selected by majority vote across three cluster validity indices. The Technical Activity dimension produced two clusters (Minimal Activity: 62.0%, n = 3,462; Active Collaboration: 38.0%, n = 2,120; Silhouette = 0.4464; Davies-Bouldin = 0.8694; Calinski-Harabasz = 6,003.39). The Market Success dimension produced five clusters spanning a gradient from Long-Tail repositories (22.3%, n = 1,242) to Flagship repositories (7.8%, n = 438; Silhouette = 0.3699). Cross-tabulation of the two independent clustering solutions yields ten composite archetypes. The Flagship Dormant archetype (n = 39, 0.7%) identifies repositories with high historical star counts coexisting with minimal current technical activity, providing direct empirical evidence for the unreliability of star-count heuristics in tool selection. Shannon entropy analysis of programming language diversity shows systematic variation from M1 (H = 2.725 bits) to M3 (H = 3.382 bits), providing post-hoc validation of the cluster structure that is fully independent of the eight input metrics. The taxonomy offers a structured, multi-dimensional vocabulary for tool selection, ecosystem investment, and repository health monitoring.

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3. Accounting Education in the Era of Artificial Intelligence: Preparing Future-Ready Professionals

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Artificial intelligence is rapidly changing how accounting gets done, necessitating the need for accounting educators to rethink what they teach future accountants. From machine learning and robotic process automation to predictive analytics, AI tools are already embedded in financial reporting, auditing, taxation, fraud detection, and strategic planning. As these technologies take over mechanical, rule-based tasks, the accountant's role is shifting from record-keeping toward data interpretation, professional judgment, and business advisory. This shift places real pressure on educators to update not just what they teach but how they teach it. Drawing on recent literature, therefore, this study attempts to examine what AI means for accounting education, weighing both the promises and pitfalls. Specifically, the study explores how AI can enhance learning through tailored instruction, smart tutoring, simulations, faster feedback, and data-rich classrooms. In addition, the paper also takes an honest look at the obstacles such as outdated curricula, instructors who may not feel ready to teach new technologies, ethical considerations, academic integrity risks, limited infrastructure, and resistance to change. The findings of this study have a number of implications. For educators, the findings underscore the need to embed AI literacy and data analytics across the curriculum, not as electives, but as core competencies woven into every course. For professional bodies, the study highlights the importance of updating competency frameworks and continuing professional development. For administrators, it points to strategic investment in faculty training, infrastructure, and cross-disciplinary collaboration. More broadly, this research offers a roadmap for guiding AI integration, balancing innovation with ethical responsibility and the cultivation of uniquely human skills like critical thinking. Overall, the study aims to spark conversation and action, not just about how to keep pace with change, but how to shape the future of the profession in ways that are thoughtful, inclusive, and genuinely forward-looking.

4. Adaptive Endpoint Detection and Response Using Lightweight Artificial Intelligence for Enterprise Cyber Defense

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Zero-day attacks and advanced persistent threats (APTs) continue to evade traditional signature-based security measures, yet many machine learning (ML)-driven Endpoint Detection and Response (EDR) systems demand excessive computational resources that make them impractical for small and medium-sized enterprises. This paper presents a lightweight ML-based EDR prototype that balances detection accuracy with operational efficiency for resource-constrained endpoints. The system combines a Convolutional Neural Network (CNN) and a Random Forest classifier with a containerized Elasticsearch- Kibana pipeline for real-time log processing and visualization, augmented with a reinforcement-learning adaptive-threshold agent and a MITRE ATT&CK mapper. Training and evaluation on the CSE-CIC-IDS2018 dataset and synthetic Windows system logs show that the Random Forest achieves 97.4% accuracy with a 1.02% false positive rate on network intrusion data, while the CNN achieves 97.3% accuracy and 86.8% recall on endpoint-style sequences, exceeding a published 84.08% recall baseline. A DQN-based adaptive-threshold agent maintains recall above this baseline under a simulated shifting attack-density regime using only label-free observations. The complete pipeline was verified end-to-end, indexing 38,590 alerts into Elasticsearch with zero errors. These results demonstrate that the proposed system offers a scalable, cost-effective, and honestly-evaluated alternative to conventional EDR tools, with practical applicability in resource-limited business and defense environments.

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Keywords: *Convolutional Neural Networks, Endpoint Detection and Response, Machine Learning, MITRE ATT&CK, Random Forest, Resource-Constrained Systems*

5. Adoption and Utilization of Artificial Intelligence Technologies for Research by Academics in the Department of Library and Information Science, Ahmadu Bello University, Zaria

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This study examined the adoption and utilization of artificial intelligence (AI) technologies for the conduct of research by academics in the Department of Library and Information Science, Ahmadu Bello University, Zaria. The study was guided by three objectives: to determine academics' awareness of AI technologies for research, examine the extent of their utilization across research activities, and identify strategies for enhancing their responsible adoption. The study was anchored on the Technology Acceptance Model (TAM) and adopted a descriptive survey research design. The population comprised 20 academic staff members in the department, and a total enumeration technique was employed because the population was small and manageable. Data were collected using a structured questionnaire titled Questionnaire on the Adoption of Artificial Intelligence Technologies for Research among Academics. The data were analyzed using descriptive statistics, including frequency counts, percentages, mean scores, and standard deviations. The findings revealed that respondents had high awareness of widely used AI technologies such as ChatGPT, Grammarly AI, Google Gemini, and Microsoft Copilot, while awareness of Scite Assistant and ResearchRabbit was relatively low. AI technologies were widely utilized for academic writing, proofreading, literature searching, topic development, and reference management but were less frequently used for data analysis. The study concluded that AI technologies have significant potential to improve research productivity and quality when supported by adequate training, institutional policies, ethical guidelines, and the critical verification of AI-generated outputs. The study recommended continuous capacity building and institutional support to promote the responsible and effective adoption of AI technologies in academic research.

6. Adult Education Lecturers' Utilisation of Generative AI in Teaching in Universities in South East, Nigeria: Perceived Benefits and Challenges

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This study examined the perceived benefits and challenges of utilising generative AI in teaching among adult education lecturers in universities in South East, Nigeria. Three research questions guided the study. The study adopted a descriptive survey design. The population comprised 75 adult education lecturers in the five tertiary institutions offering adult education programmes in South East, Nigeria. A census approach was adopted, and the entire population of 75 lecturers was used for the study. The instruments for data collection were a 48-item researcher developed questionnaire titled: "Generative AI Utilisation in Teaching Questionnaire (GAUTQ)". The instrument was structured on a 4-point rating scale. The instruments were validated by three experts. Cronbach Alpha was used to determine the reliability of the instrument which yielded a coefficient of 0.78. Five research assistants administered and collected the instruments. Out of the 75 copies administered, 72 copies, representing a 96% return rate, were retrieved and used for data analysis. Data were analysed using mean and standard deviation, with 2.50 as the decision criterion. The findings revealed that the level of utilisation of generative AI tools by adult education lecturers in teaching in universities in South East State was low. The study further revealed that lecturers agreed that generative AI among others can support lesson planning and preparation of instructional materials, simplify complex concepts, improve facilitator productivity, assist in assessment and feedback, and improve access to up-to-date information for adult learners. The findings finally revealed that limited knowledge and skills in the use of generative AI tools, inadequate training and capacity building, lack of institutional policy and support, ethical concerns, concerns about the accuracy and reliability of AI-generated content among others are the hindering the use of generative AI among adult education lecturers in universities in South East, Nigeria. Hence the study recommended among others that university managements, faculties of education, and relevant stakeholders should organise regular training, workshops, and seminars on the effective and ethical use of generative AI tools to improve adult education lecturers' knowledge, skills, and confidence in integrating generative AI into teaching and learning.

Keywords: *generative AI, adult education lecturers, utilisation, perceived benefits, challenges, South East Nigeria*

7. AI driven solution for Environmental Pollution Control: Challenges and Prospect

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Environmental pollution remains one of the most significant threats to global public health and ecological sustainability. Rapid urbanization, industrialization, and unsustainable human activities have intensified air, water, and land pollution, as a result of which conventional pollution control approaches have often proved inadequate in

addressing these growing environmental challenges. Artificial Intelligence (AI) has emerged as a transformative technology capable of enhancing pollution monitoring, prediction, prevention, and remediation through intelligent data analysis and automated decision-making. This paper reviews the prospects and challenges of AI-driven solutions for environmental pollution control across major environmental domains. It examines the application of AI in real-time pollution monitoring, hyper-local air quality forecasting, intelligent wastewater treatment, automated waste sorting, industrial emission control, and support for sustainable practices such as renewable energy integration, electric mobility, and green infrastructure. The review also highlights key challenges limiting the effective deployment of AI, including high energy and water consumption by data centers, electronic waste generation, environmental impacts associated with rare-earth mineral extraction, data quality concerns, ethical issues, and the shortage of AI professionals with environmental expertise. The paper concludes that while AI offers significant opportunities for improving environmental management and accelerating sustainable development, addressing these technical, environmental, and institutional challenges are essential to realize its full potential in pollution control.

8. AI readiness of Nigerian University graduates for the digital workplace

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The global workforce is rapidly becoming digital and the job requirements have also changed accordingly, necessitating high digital adaptability. The global workforce has been transformed with the addition of Artificial Intelligence (AI) and so have the requirements of the job which now require high digital adaptability. In Nigeria, there's a disconnect between the digital workplace and university curricula. This study aims to explore the AI readiness of Nigerian university graduates in recent years, examining their technical proficiency and readiness for AI-based workplaces. The study was based on three research questions and two hypotheses: institutional background, fields of study, and competency in AI. Descriptive research design was adopted and quantitative data were obtained from 600 graduands of all Nigerian Universities of both federal, state and private universities. Descriptive and inferential statistics were used in analyzing the data with thematic analysis also included. Results show that there are substantial differences in the readiness of institutions in the area of AI depending on the discipline. Most of the public university graduates showed low levels of practical competency; STEM and private university graduates showed moderate levels of AI literacy. Some key shortcomings in data literacy, AI ethics, and prompt engineering were identified. Hands-on experience is the real problem with graduates, industry experts said. Based on the study results, it is recommended to introduce obligatory courses on the foundations of artificial intelligence, expand funding for public institutions of infrastructure, and promote university-industry cooperation.

Keywords: *Artificial Intelligence, AI Readiness, Graduate Employability, Higher Education, Nigerian Universities, Digital Workplace.*

9. AI, Emerging Technology, and Future Learning: Rethinking Pedagogy, Equity, and Human Agency

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The rapid convergence of artificial intelligence (AI), immersive environments, adaptive learning systems, and other developing technologies is reshaping the landscape of education in unique ways. This study argues that future learning need move beyond the mere integration of digital tools into existing classroom models and fundamentally re-conceptualize pedagogical goals, assessment frameworks, and the very nature of knowledge creation. Drawing on current trends in generative AI, learning analytics, and extended reality, three necessary core shifts were proposed which includes a transition from content recall to AIaugmented critical thinking and prompt literacy; the development of ethical guardrails to mitigate algorithmic bias, data privacy risks, and the digital divide; and a renewed focus on humancentric skillscreativity, collaboration, and meta-cognition that technology cannot replicate. While emerging technologies offer powerful opportunities for personalization and access, the study cautioned against technodeterminism and argue that without deliberate pedagogical redesign and inclusive policy, future learning risks deepening existing inequities. This paper synthesizes interdisciplinary evidence to offer a set of actionable principles for academics and researchers, industry and EdTech innovators, policymakers and regulators, students and early career scholars, and technologistsnavigating the uncertain but inevitable transformation of education in an AI-mediated world.

Keywords: *Artificial Intelligence; Emerging Technology; Future Learning; Pedagogical Innovation; Human-Centered Design*

10. AI, Indigenous Oral Performance and the Digital Divide: Reimagining Choloko Oral Performance for Future-Ready Higher Education in Africa

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The shift to online education in Africa offers a chance to improve access to knowledge and support innovative teaching. However, there are significant gaps in digital resources, including unequal access to devices, internet, and relevant digital content. This study looks into using Tiv Choloko oral performance to address these issues and help shape a higher education system in Africa for the future. Choloko, mainly associated with female Tiv poets, embodies local knowledge and creativity that can integrate with digital platforms and education. The research discusses how digitizing Choloko can preserve culture, promote local languages, enhance digital skills, and encourage new teaching methods. However, it also identifies challenges such as poor infrastructure, lack of Tiv language resources, algorithmic bias, cultural ownership issues, and unequal technology access. The study suggests a collaborative model involving universities, cultural custodians, language experts, and learners to document, digitize, and teach Choloko. It concludes that African higher education should not only use digital tools but also produce meaningful digital knowledge tied to its culture. Integrating Choloko can sustain cultural heritage and boost inclusivity and innovation in education.

Keywords: *Choloko, digital divide, artificial intelligence, digital humanities, digital pedagogy*

11. Ai-Blended Learning, Demonstration, Expository Method and Secondary School Chemistry Students' Achievement in Air Pollution in Uyo, Nigeria

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The study explored the effects of AI-blended learning, demonstration and expository methods on students' academic achievement using the concept of air pollution in public secondary schools in Uyo Local Government Area, Akwa Ibom State. In pursuance of the study, three research questions and three null hypotheses were carefully formulated to guide the study. Quasi-experimental research design was adopted for the study and a non-randomized pre-test, post-test setting. The Area of the study was Uyo Local Government Area while the population of the study comprised 110 (SS1) Chemistry students in all the 14 Public Co-educational Secondary Schools in Uyo Local Government Area of Akwa Ibom State for the 2025/2026 academic session. The sample comprised two hundred and eighty one senior secondary one (SS1) students (184) male and ninety seven 97 (females) from three (3) intact classes in three schools from the study area. The instrument for data collection was the Achievement Test on Air Pollution (ATAP) adapted from standardized past WAEC, JAMB and NECO past question papers. The reliability coefficient of the instrument was determined using Pearson Product Moment Correlation Coefficient. The data obtained from the pre-test, post-test Analysis of Covariance (ANCOVA) and regression statistics. Mean and standard deviation were used to answer the research questions while ANCOVA and regression were used to test the null hypotheses formulated at 0.05 level of significance. The results showed that there was a significant difference in the mean achievement scores of the students taught air pollution using AI-blended learning, demonstration and expository methods in favour of those taught the concept using AI-Blended learning. Consequently, it was concluded that the use of AI-Blended learning approach enhances students' achievement in the concept of air pollution in chemistry in secondary schools in Uyo, Nigeria.

Keywords: *Academic Achievement, AI-Blended Learning, Demonstration, Expository, Teaching Method and Air Pollution.*

12. Ai-Powered Identification of Freshwater Zooplankton for Aquaculture Education and Research in Ilawe Ekiti, Southwestern Nigeria

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Freshwater zooplankton such as Rotifera, Cladocera and Copepoda are indispensable live feeds for larval rearing of Clarias gariepinus, yet their manual identification remains a major pedagogical bottleneck in aquaculture training. This study developed an Artificial Intelligence system for automated identification of zooplankton in selected water bodies of Ilawe-Ekiti, Ekiti State, as a digital innovation for higher education. Water samples were collected from three major water bodies in Ilawe-Ekiti. Zooplankton samples were imaged using a digital microscope, annotated by experts, and used to train a Convolutional Neural Network (CNN) model for automated classification. Model performance was

evaluated using accuracy, precision, recall and F1-score. Results showed the model achieved 92.4% accuracy with high precision for Rotifera (94%) and Cladocera (91%), significantly reducing identification time from hours of microscopy to minutes. The system was piloted as a virtual laboratory tool for NCE students, improving practical understanding of live feed production and digital literacy. The study demonstrates how AI reimagines aquaculture education through smart laboratory tools, enhancing research capacity and graduate employability. It recommends integration of AI-driven identification systems into fisheries curriculum in colleges of education in line with the theme of Digital Innovation and Higher Education in Africa.

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Keywords: *Artificial Intelligence, Zooplankton, Aquaculture Education, Machine Learning, Ilawe-Ekiti*

13. AI-Powered Language Learning Assistants for Hausa Language: Investigating the Effectiveness of AI Chatbots in Providing Personalized Learning Experiences

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In order to achieve fluency faster and more interactive by providing real-time pronunciation feedback, customized vocabulary drills, and judgment-free conversation practice, AI-Powered Language Assistants could be effectively used. These tools adapt to a specific proficiency level, allowing you to learn naturally rather than relying solely on repetitive, one-size-fits-all textbooks The integration of artificial intelligence (AI) into educational frameworks has revolutionized language acquisition methodologies. This study investigates the efficacy of AI-powered chatbots in delivering personalized language learning experiences specifically for learners of the Hausa language. Utilizing a mixed-methods research design, we conducted qualitative interviews and quantitative surveys with participants who engaged with AI chatbots over a six-month period. The findings reveal that features such as personalized feedback, adaptive learning trajectories, and opportunities for conversational practice substantially enhance learner engagement, retention, and overall language proficiency. This research contributes to the growing discourse on language learning technologies and underscores the transformative potential of AI chatbots in promoting the education of minority languages.

Keywords: *Artificial Intelligence, Language Learning, Chatbots, Hausa Language, Educational Technology*

14. Algorithmic Governance and Digital Equity in Sub Saharan African Higher Education

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Background Institutions of higher education in Africa Sub-Saharan region are rapidly adopting AI-driven systems for their admissions, educational analytics, and student support services. But, at present, there is hardly any concrete data showing if these digital technologies will assist Lastly the digital divide or if they might be the ones that deepen it further. Despite the active discussions around AI, issues such as bias in algorithms, data privacy, and uneven distribution of infrastructure leading to inequality have been hardly addressed in higher education in the region. Objective This study investigated how algorithmic governance practices influence digital equity in East African universities. Specifically, we examined: (1) the prevalence and types of AI tools currently deployed; (2) perceived barriers to equitable access and outcomes; and (3) strategic institutional capabilities that mediate the relationship between AI adoption and inclusive learning environments. Methods A convergent mixed methods design was employed. Phase 1: Survey of 284 academic staff, administrators, and students from six universities in Kenya and Uganda (stratified by public/private and technology maturity level). Phase 2: Semi structured interviews with 24 university leaders, EdTech coordinators, and policy officers. Quantitative data were analysed using descriptive statistics and ordinal logistic regression; qualitative data underwent thematic analysis. The study drew on Githui's algorithmic sovereignty framework and Njuru's higher education partnership model. Results Most institutions surveyed admitted to using at least one AI tool, for example, automated admissions, plagiarism detection, or predictive analytics. Yet, only a few had a formal algorithmic governance policy. Significant equity gaps were unveiled: students from low-income backgrounds and those with limited digital access at home were much less inclined to consider AI tools fair or helpful. Three main barriers to institutional adoption of AI came out of the research. Firstly, lack of AI literacy among faculty. Secondly, absence of locally relevant datasets. Thirdly, lack of stakeholder engagement in the design of the tools. But, universities which set up multi-stakeholder AI oversight committees saw a dramatic increase in student satisfaction with digital services and a decrease in the number of dropouts in courses mediated by AI. Essential strategic enablers included providing staff and students with inclusive AI training, using transparent data consent protocols, and forming partnerships with government, EdTech companies, and civil society for the co-design

of affordable solutions. Conclusion Algorithmic governance does not bring equality by default. If there is no deliberate strategic intervention, the use of AI in African higher education could worsen the digital divide. But, the data reveals that universities are able to close these disparities through inclusive governance, skills enhancement, and co-innovation. In this paper, we recommend a Strategic Digital Equity System based on three main elements: Policy & Ethics, Infrastructure Sensitive to Local Context, and Participatory Design. This research gives a roadmap that university administrators, government officials, and international development agencies can use to prepare inclusive and future-ready higher education ecosystems in Africa.

15. Analysis of Emerging Technologies used in Teaching Vocational and Technical Education in North-Eastern Nigeria Tertiary Institutions

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The study analyzed emerging technologies used in teaching vocational and technical education in North Eastern Nigerian tertiary institutions. It specifically, identified the emerging technologies available, determines the relationship between the utilization of emerging technologies and effectiveness of teaching vocational and technical education and identified the challenges associated with the utilization of emerging technologies. Multistage sampling technique was used to sample 376 respondents and data collected were analyzed using descriptive statistics such as mean and frequency and Pearson Product-Moment Correlation. The result revealed that digital projectors (91.0%), learning management systems (85.1%), mobile learning applications (79.3%) and digital assessment platforms (76.1%) were the most available emerging technologies, while artificial intelligence tools (37.2%) and virtual laboratories (44.4%) were the least. The Pearson Product-Moment Correlation analysis result shows a correlation coefficient of r = 0.68 indicates a strong positive relationship, which implies increased in utilization of emerging technologies is associated with improved effectiveness of teaching vocational and technical education. Furthermore, the result disclosed that the highest-rated challenges were unreliable electricity supply (= 3.71), insufficient training of lecturers on emerging technologies (= 3.62), inadequate funding for acquisition of technologies (mean score = 3.58) and inadequate access to modern technological equipment (=3.55), while the least-rated challenge, although still considered significant, were cyber security (=2.08) and data privacy concerns (=1.76). The study recommends that government agencies, institutional administrators, and relevant stakeholders should allocate adequate funds for the procurement, installation, and maintenance of emerging technologies especially advanced technologies such as artificial intelligence tools, virtual laboratories, and simulation software, which were found to be less available in the institutions, with the significant positive relationship between the utilization of emerging technologies and teaching effectiveness, educational policymakers, institutional administrators and lecturers should prioritize the adoption and effective utilization of emerging technologies and regular training workshops, seminars, conferences, and certification programmes should be organized to enhance lecturers' competencies in the use of emerging technologies which will focus on Learning Management Systems, artificial intelligence applications, virtual laboratories, simulation software, digital assessment tools, and other innovative instructional technologies.

16. Application of Ai- enhanced learning tools in improving participation and interest in Social Studies Among Senior Secondary School Students in Edda LGA, Ebonyi State

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This study investigated the application of AI- enhanced learning tools in improving students' participation and interest in Social Studies among secondary school students in Edda LGA of Ebonyi State. Two research questions and two hypotheses guided the study. The population of the study was 450 students from which a sample of 180 students were drawn. Descriptive survey design was used for data analysis while instrument for data was a reseacher made questionnaire titled : Application of AI- enhanced learning tools in improving students' participation and interest in Social Studies (AALTISPISS). The instrument was validated by experts and tested for reliability with a CronbachAloha, a coefficient of 0.75 was obtained and it was considered reliable. Findings revealed that AI enhanced tools significantly impact on students' participation and interest in Social Studies. It was recommended that adequate provision of computers and internet services should be made available in the secondary schools for more students' engagement.

17. Artificial Intelligence (AI) and Tax Revenue Generation in FCT ABUJA, Nigeria (2020-2025)

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Conference theme: Bridging the Digital Divide: Reimagining Future - Ready Higher Education Ecosystem in Africa

Artificial Intelligence (AI) and Tax Revenue Generation in FCT ABUJA, Nigeria (2020-2025) BY 1. Dr. Matilukuro OLUWAKOREDE MUYIDEEN, Economic Planning, Revenue Generation, Public-Private and Partnership Secretariat (EPRGPPPS) Federal Capital Territory Administration (FCTA), Abuja, Nigeria 2. Mr. Ojo Rotimi Olalekan, Economic Planning, Revenue Generation, Public-Private and Partnership Secretariat (EPRGPPPS) Federal Capital Territory Administration (FCTA), Abuja, Nigeria 3. Mr. Uba A. Bala, Economic Planning, Revenue Generation, Public-Private and Partnership Secretariat (EPRGPPPS) Federal Capital Territory Administration (FCTA), Abuja, Nigeria , and 4. Mr. Useh Uwem Jonah, Economic Planning, Revenue Generation, Public-Private and Partnership Secretariat (EPRGPPPS) Federal Capital Territory Administration (FCTA), Abuja, Nigeria , Abstract This study examines the integration of Artificial Intelligence (AI) in tax administration and its effect on tax revenue generation in FCT-Abuja, between 2020 and 2025. The research is driven by the need to understand how emerging technologies, particularly AI, can enhance the efficiency and effectiveness of tax systems in the area. Specifically, the study examines the extent of AI integration in tax processes, evaluates its effect on tax compliance and revenue performance and identifies key challenges limiting its adoption. The research adopted a descriptive survey design and targeted tax officials, administrators, and IT staff of Federal Inland Revenue Service in FCT-Abuja, Nigeria. 75 staff members served as the sample size for the study. Data were collected using a structured questionnaire and analyzed using descriptive statistics such as frequency and percentage tables while t-test was used to test the hypotheses. Findings reveal that Artificial Intelligence (AI) integration into tax administration in FCT-Abuja, is minimal; AI adoption has not yet significantly impacted tax compliance or revenue generation in the area. Finally, the main challenges include poor technological infrastructure, lack of adequate technical expertise among tax officials, among others. The study recommends the government should strengthen technological infrastructure; conduct regular training programs to equip tax administrators with skills in AI tools; develop and enforce policies that regulate AI adoption in tax administration in FCT-Abuja Nigeria.

Keywords: *Artificial Intelligence (AI), Tax, Revenue generation, Technology, FCT, Policy, Integration.*

18. Artificial Intelligence (AI) as an Emerging Field in Teaching NMR Structural Elucidation of Organic Compounds

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Nuclear magnetic resonance (NMR) spectroscopy is an essential analytical technique used in determining the structure of organic compounds. However, traditional method of interpreting NMR spectra remains a labor-intensive and expertise-dependent process, mostly for complex or novel compounds. Consequently, to address these challenges, advanced computational approaches have demonstrated significant potential in addressing these tasks. Therefore, coupling artificial intelligence (AI) with NMR had accelerated the structural elucidation of organic compounds compared to traditional method. Specifically, AI as an emerging field that evolved as a transformative tool in this field, significantly enhances the speed, efficiency, and accuracy of structural elucidation via processing complex spectral data, predicting chemical shifts, and automating the correlation between experimental and calculated data, leading to faster and more accurate structural determination of unknown compounds. This mini review aims to explore the application of AI in structural elucidation of organic compounds such as natural products, particularly due to their specific features in terms of structural complexity and scaffold diversity compared to synthetic analogs.

Keywords: *NMR, AI, structural elucidation, Organic compounds, spectra*

19. Artificial Intelligence Adoption and Administrative Effectiveness in Nigerian Universities: Implications for Educational Management

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The increasing integration of Artificial Intelligence (AI) into higher education administration is reshaping institutional processes and creating new opportunities for enhancing administrative effectiveness. Despite the growing relevance of

AI-driven technologies in university management, evidence on their adoption and influence on administrative performance in Nigerian universities remains limited. This study examines the extent to which AI adoption contributes to administrative effectiveness in Nigerian universities and explores its implications for educational management. Specifically, the study investigates the role of AI in improving decision-making, resource management, operational efficiency, service delivery, and institutional responsiveness. The study is anchored on the Technology Acceptance Model (TAM) and adopts a descriptive survey research design. The target population comprises academic and administrative managers in selected Nigerian universities, while data are proposed to be collected through a structured questionnaire and analyzed using descriptive and inferential statistical techniques. The study is expected to provide empirical evidence on the relationship between AI adoption and administrative effectiveness in higher education institutions. Furthermore, it seeks to identify critical factors influencing the successful implementation of AI technologies within university administrative systems. The findings are anticipated to contribute to policy formulation, institutional planning, and leadership practices aimed at strengthening governance and organizational performance. The study concludes that the strategic adoption of AI has the potential to transform university administration and enhance institutional effectiveness, thereby positioning Nigerian universities to meet the demands of an increasingly digital and knowledge-driven society.

20. Artificial intelligence and capacity building for sustainable business operations in Nigeria

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Artificial Intelligence and Capacity Building for Sustainable Business Operations in NigeriaByProf. Paul Aondona AngaharDepartment of AccountingRev. Fr, Moses Orshio Adasu University Makurdi.&Dr. Stephen GwarDepartment of AccountingRev. Fr, Moses Orshio Adasu University Makurdi..Abstract The adoption of Artificial Intelligence (AI) presents a transformative opportunity for advancing sustainable business practices in Nigeria. This paper explores the role of AI in enhancing operational efficiency, promoting resource optimization, and supporting environmentally responsible practices in Nigerian businesses. With a focus on sectors such as agriculture, energy, waste management, financial services, and supply chain management, the paper discusses how AI can drive sustainable development by improving decision-making processes and minimizing environmental impact. However, the integration of AI in Nigeria faces significant challenges, including inadequate digital infrastructure, high implementation costs, limited AI literacy, and regulatory uncertainties. The paper argues that capacity building—through investments in digital infrastructure, AI education, and targeted policy support—is critical for overcoming these barriers and fostering a more inclusive and sustainable business ecosystem. The discussion also addresses ethical considerations and the social implications of AI adoption, such as data privacy concerns, job displacement, and the potential widening of the digital divide. By examining these factors, the paper offers practical recommendations for promoting AI-driven sustainability in Nigeria, providing a roadmap for businesses, policymakers, and educational institutions to collaborate in harnessing AI for long-term socio-economic and environmental benefits.

21. Artificial Intelligence and Cultural Preservation: Conceptional Analysis of Hausa Language

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Artificial Intelligence (AI) serves as a transformative tool for cultural preservation, Presenting distinct advantages and challenges for the Hausa Language. It presents a powerful opportunity for preserving and promoting Hausa culture, Language and Literature. This study explored an intersection of artificial intelligence (AI) and indigenous knowledge with reference to the Hausa language, especially how AI is mediating, influencing, and potentially disrupting culturally ingrained epistemologies in the academic context. While on one hand, AI is efficient in translation, text generation, and data processing, its effectiveness, on the other hand, depends on the availability of highly-resourced language datasets, which marginalise low-resource languages, distorting meaning and flattening epistemic and interpretative depth. Using a qualitative research methodology, this conceptual analysis examines AI-produced Hausa texts and draws on previous studies to identify problems in linguistic representation. Observations from 15 respondents (researchers and students) reveal a series of problems in the context of linguistic representation, tonal accuracy, and culturally-based interpretation. Informed by cultural hermeneutics, it becomes clear that AI is unable to reproduce the contextual, moral, and philosophical richness in Hausa proverbs and written poetry, oral narratives, and the ‘Ajami’ manuscripts.

Using the Chat GPT tool to translate some Hausa words and proverbs, the results reveal that indigenous knowledge has been reiterated into Hausa-based AI corpora, with online archiving and humanities-driven partnerships between linguists and AI engineers. The paper, therefore, considers African languages as the epistemic partners, as opposed to marginal datasets, such that the integration of AI would continue to contribute to the cultural and academic authority.

22. Artificial Intelligence and Digital Research Infrastructure for Sustainable Nanomaterial Development: Reimagining Environmental Research and Innovation in African Higher Education

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The rapid evolution of artificial intelligence (AI) and digital research infrastructure is transforming scientific research, creating unprecedented opportunities for sustainable innovation in higher education. In Africa, however, environmental research, particularly in nanomaterial development for wastewater treatment, continues to face significant challenges, including limited digital laboratory infrastructure, inadequate access to advanced analytical tools, fragmented research data systems, and weak interdisciplinary collaboration. This paper explores how AI-driven technologies and digital research ecosystems can enhance the development, characterization, and optimization of sustainable nanomaterials for environmental remediation while strengthening research capacity within African universities. Drawing on the case of biochar–zinc oxide (ZnO) nanocomposites derived from agricultural waste for the photocatalytic degradation of cationic dyes, the paper demonstrates the potential of integrating machine learning, computational modelling, digital instrumentation, cloud-based research platforms, and intelligent data analytics to accelerate materials discovery, improve experimental efficiency, and foster reproducible research. Beyond the scientific dimension, the paper examines the implications of digital transformation for postgraduate education, research collaboration, institutional innovation, and the development of future-ready researchers capable of addressing Africa's environmental sustainability challenges. It argues that strategic investment in AI-enabled laboratories, digital infrastructure, and interdisciplinary research ecosystems will bridge the digital divide in environmental science education and position African higher education institutions as global contributors to sustainable technological innovation. The paper concludes by proposing a framework for integrating AI and digital research infrastructure into environmental nanomaterials research to promote sustainable development, knowledge creation, and innovation across African universities.

23. Artificial Intelligence and Digital Storytelling as Tools for Preserving African Indigenous Knowledge and Promoting Cultural Sustainability in Higher Education

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African indigenous knowledge represents the cultural heritage, values, traditions, languages, and histories that have shaped communities across the continent for generations. However, globalization, modernization, and the rapid growth of digital technologies have contributed to the gradual decline of many indigenous knowledge systems. This situation highlights the need for innovative approaches to preserve and promote African cultural heritage, particularly within higher education institutions. This paper examines the role of Artificial Intelligence (AI) and digital storytelling in preserving African indigenous knowledge and promoting cultural sustainability in higher education. The study explores how AI can support the documentation, storage, translation, and dissemination of cultural narratives and traditional knowledge. It also highlights how digital storytelling can transform oral traditions, folklore, and historical accounts into engaging learning resources that enhance students' understanding of African cultures. The paper argues that integrating AI and digital storytelling into higher education can bridge the gap between traditional knowledge systems and modern digital learning environments. Such integration can improve student engagement, strengthen cultural identity, support digital literacy, and encourage innovation in teaching and learning. AI-powered platforms and digital heritage initiatives can increase access to indigenous knowledge and ensure its preservation for future generations. The study concludes that higher education institutions should adopt innovative digital strategies that promote cultural sustainability while preparing learners for participation in a rapidly evolving digital society.

Keywords: *Artificial Intelligence, Digital Storytelling, Indigenous Knowledge, Cultural Sustainability, African Higher Education, Digital Innovation.*

24. Artificial Intelligence and Digital Technologies in Advancing Medicinal Plant Research and Natural Product Drug Discovery in Africa – A Review

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Africa holds exceptional plant diversity and a deep heritage of traditional medicine, yet the continent contributes disproportionately little to global natural product drug discovery. Conventional workflows that depend on field collection, bioassay-guided fractionation, and low-throughput screening are slow, costly, and poorly suited to the scale of available biodiversity. Artificial intelligence (AI) and allied digital technologies offer a way to compress these timelines and extend research capacity across the continent. This review synthesises recent progress in applying machine learning, deep learning, natural language processing, computer vision, molecular modelling, and omics-driven analytics to medicinal plant research and drug discovery, with emphasis on African contexts. It examines AI-assisted species identification and authentication, metabolomics and dereplication, virtual screening and ADMET prediction, genome mining, and the digitisation of ethnomedical knowledge. Regional databases, tools, and initiatives are summarised, and persistent barriers are discussed, including data scarcity and bias, infrastructure and skills gaps, weak regulatory frameworks, and unresolved questions of data sovereignty and benefit sharing. Future prospects include federated learning, foundation models for chemistry and biology, FAIR- and CARE-aligned data ecosystems, and integrated African research networks. Responsible, locally led adoption of AI could accelerate the translation of African medicinal plants into safe, standardised, and affordable therapeutics.

Keywords: *artificial intelligence; machine learning; medicinal plants; natural products; drug discovery; digital technologies; African biodiversity; cheminformatics; metabolomics; data sovereignty*

25. Artificial Intelligence and Digital Technologies in Fisheries and Aquaculture Education: Implications for Practical Skills Development and Graduate Employability in Nigeria

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The rapid advancement of artificial intelligence and digital technologies is transforming higher education, agricultural production, fisheries and aquaculture globally. The integration of these technologies into fisheries and aquaculture education presents significant opportunities for improving teaching and learning, strengthening practical skills acquisition, enhancing research capacity and preparing graduates for emerging employment opportunities in the digital economy. However, fisheries and aquaculture education in many developing countries, including Nigeria, continues to face challenges associated with inadequate practical training facilities, limited access to modern technological equipment, insufficient industry-academia collaboration and a mismatch between university graduates' competencies and labour market requirements. This paper reviews the application of artificial intelligence and digital technologies in fisheries and aquaculture education, with particular emphasis on their implications for practical skills development and graduate employability in Nigeria. The review draws on relevant peer-reviewed publications, institutional reports and policy documents on artificial intelligence, digital education, aquaculture innovation and workforce development. It examines the application of AI-powered learning platforms, machine learning, Internet of Things, virtual laboratories, remote sensing, geographic information systems, computer vision, automated fish-feeding systems and digital aquaculture management tools in fisheries and aquaculture education. The review indicates that these technologies can facilitate interactive learning, improve students' understanding of complex fisheries and aquaculture processes, strengthen practical competencies and expose graduates to emerging technological requirements in the fisheries and aquaculture industries. Furthermore, digital competencies in fish farm management, water quality monitoring, disease detection, fish production forecasting, fisheries data analysis and digital entrepreneurship can improve graduates' opportunities for employment and self-employment. Nevertheless, inadequate infrastructure, unreliable electricity, high equipment costs, limited internet connectivity, insufficient lecturers' digital competencies, cyber security concerns and inadequate institutional funding remain significant barriers to adoption in Nigeria. The paper concludes that integrating artificial intelligence and digital technologies into fisheries and aquaculture education is essential for producing technologically competent, innovative and employable graduates. It recommends curriculum modernisation, investment in digital infrastructure, staff capacity development, establishment of smart aquaculture laboratories, industry-academia partnerships and the adoption of practical, technology-driven teaching approaches in Nigerian universities.

Keywords: *Artificial Intelligence, Digital Technologies, Fisheries Education, Aquaculture Education, Practical Skills Development, Graduate Employability, Higher Education, Nigeria*

26. Artificial Intelligence and Economics Education: Problems and Prospects for Tertiary Institutions in Nigeria

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This paper examines the intersection of AI and economics education in Nigeria, exploring the pedagogical, technological, and structural dimensions of this evolving relationship. It investigates how AI is transforming the teaching of economic theories, quantitative reasoning, and policy simulation. The paper presents comparative insights from institutions in Nigeria, that have adopted AI-driven platforms to enhance curriculum delivery, learner engagement, and data-driven instruction in economics education. It identifies multiple challenges, including digital inequality, limited teacher capacity and weak institutional frameworks for AI integration. The paper proposes a set of strategic policy and pedagogical recommendations: investment in open-source and locally developed AI tools, capacity-building for economics educators in digital pedagogy and institutional frameworks for inclusive and accountable AI governance in education. The paper concludes that, while significant obstacles persist, the thoughtful integration of AI into economics education can serve as a catalyst for pedagogical innovation, critical economic thinking, and inclusive educational development.

27. Artificial Intelligence and Emerging Technologies in Biology Education: Opportunities, Challenges and Readiness for Future Learning in Sokoto State, Nigeria

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The development of Artificial Intelligence (AI) and emerging technologies is transforming teaching and learning in science education. This study examines the opportunities, challenges, and readiness associated with integrating AI and emerging technologies into Biology education in Sokoto State, Nigeria. A mixed-methods research design will be adopted, involving Biology teachers and lecturers in institutions. Data will be collected using questionnaires and semi-structured interviews. Quantitative data will be analysed using descriptive and inferential statistics, while qualitative data will be analysed thematically. The study will examine the potential of generative AI, virtual laboratories, augmented and virtual reality, intelligent tutoring systems, and AI-supported assessment to enhance conceptual understanding, learner engagement, personalised learning, practical experiences, and access to resources. It will also investigate challenges including inadequate digital infrastructure, unreliable electricity supply, limited internet connectivity, insufficient digital competencies, cost, ethical concerns, and inadequate professional development. The study is expected to determine educators' readiness to integrate AI and emerging technologies and provide evidence for developing quality strategies for Biology education in Sokoto State. Findings will contribute to digital competencies, teacher training, infrastructure development, and responsible technology integration in Biology education in Sokoto State.

Keywords: *Artificial Intelligence, emerging technologies, Biology education, future learning, teacher readiness, digital competence, Sokoto State*

28. Artificial Intelligence and Entrepreneurial Behaviour among Business and Entrepreneurship Education Students in Colleges of Education in Nigeria

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This study explored the effect of the application of artificial intelligence on entrepreneurial behaviour among Business and Entrepreneurship Education students in Colleges of Education in Nigeria. The study specifically examined the effect of artificial intelligence on entrepreneurial cognition of Business and Entrepreneurship Education students; the effect of artificial intelligence on entrepreneurial competence of Business and Entrepreneurship Education students; and the effect of artificial intelligence on the innovative spirit of Business and Entrepreneurship Education students. The study used a survey research design and data were collected using a self-administered questionnaire. The population of the study included 379 Business Education students in selected Colleges of Education in North Central Nigeria; a convenience sampling approach was used to select 150 students from various levels. The data collected were

analyzed using descriptive statistics (mean and standard deviation) and simple linear regression with the aid of the Statistical Package for Social Sciences (SPSS Version 25). The results revealed that artificial intelligence has a significant effect on all the dimensions of entrepreneurial behaviour (entrepreneurial cognition, entrepreneurial competence and innovative spirit) among Business and Entrepreneurship Education students. The study concluded that artificial intelligence has enhanced learning among students. It recommended, among others, the need for higher institutions of learning to invest in technological capabilities supporting an educational system that will generate innovative behaviour among students.

Keywords: *Artificial Intelligence, Entrepreneurial Behaviour, Entrepreneurial Cognition*

29. Artificial Intelligence and Islamic FinTech: Transforming Financial Inclusion and Future Skills Development in Nigeria

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Nigeria faces one of the most acute financial exclusion crises in sub-Saharan Africa, with over 38% of its adult population lacking access to formal financial services, a challenge disproportionately concentrated in the Muslim-majority North-West and North-East geopolitical zones. Artificial Intelligence (AI) is increasingly reshaping the global financial services sector by enhancing operational efficiency, deepening customer engagement, and widening access to financial products. Within the Islamic finance industry, AI-driven innovations have created new pathways for expanding ethical and Shari'ah-compliant financial services through Islamic Financial Technology (Islamic FinTech). The convergence of AI and Islamic FinTech offers a structurally significant opportunity to address Nigeria's financial exclusion challenge in a culturally and religiously compatible manner. Employing a systematic narrative literature review anchored in the Maqāsid al-Sharīʿah (objectives of Islamic law) framework and supported by secondary data from the Enhancing Financial Innovation and Access (EFInA) Access to Finance Survey, the Central Bank of Nigeria (CBN) financial inclusion reports, and the National Bureau of Statistics (NBS), this paper examines the role of AI in enhancing Islamic financial services and evaluates its contribution to financial inclusion in Nigeria. It analyses key AI applications including machine learning, predictive analytics, intelligent customer support systems, and automated Sharīʿah compliance mechanisms and assesses their capacity to improve the accessibility, efficiency, and reliability of Islamic financial products. Positioning financial inclusion as the central problem, AI-driven Islamic FinTech as the primary solution mechanism, and skills development as the critical policy implication, the paper further investigates the digital competencies required in the evolving Islamic finance ecosystem and assesses their implications for workforce readiness. The paper concludes that the convergence of AI and Islamic FinTech can significantly advance financial inclusion, strengthen ethical finance, and support sustainable economic growth in Nigeria. It recommends specific, context-sensitive actions by the CBN, the National Information Technology Development Agency (NITDA), tertiary education institutions, and Islamic financial institutions to foster innovation, digital literacy, and a resilient Islamic FinTech ecosystem capable of meeting the financial needs of underserved populations

30. Artificial Intelligence and the Future of Human Intelligence "A Theoretical and Applied Study on Arabic Language Students in Colleges of Kano State Nigeria

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The research aims to explore the dialectical relationship between the development of artificial intelligence technologies and the future of human intelligence, with a focus on the environment of Arabic language teaching in colleges in Kano State, Nigeria. The study addresses this topic through a theoretical framework that establishes key concepts and an applied approach that observes the actual situation of students. It also discusses the challenges arising from integrating AI into Arabic language instruction, represented by the duality of advantages and disadvantages. On the positive side, AI serves as a powerful assistive tool that helps improve students' linguistic skills, provides personalized and immediate learning environments that cater to individual differences, and facilitates access to digital dictionaries and linguistic resources, thereby enhancing students' academic achievement. On the other hand, concerning drawbacks and challenges emerge; there is a fear that excessive reliance on smart applications may lead to the atrophy of human intelligence, a decline in students' critical and creative thinking skills, and total dependence on machines for text composition and creative writing. The study offers a balanced vision calling for the integration of AI with human intelligence as a supportive partner, not as a substitute that cancels out the student's mind, with

recommendations for the necessity of training students and faculty members on the safe and effective use of these technologies.

Keywords: *Artificial Intelligence, Technology, Linguistic Skill, Future Human intelligence*

31. Artificial Intelligence and the Future of Indigenous Language Education in Nigerian Universities: Opportunities, Challenges and Implications for Pedagogy

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The rapid integration of Artificial Intelligence (AI) into higher education is revolutionising teaching, learning, research and communication worldwide. But although the major international languages are increasingly served by AI-driven educational technologies, many Nigerian indigenous languages are still under-represented in digital platforms, language models and other emerging technologies. This situation poses pertinent questions about linguistic inclusion, digital equity and the future of indigenous language education in Nigerian universities. This paper examines the opportunities and challenges of using Artificial Intelligence in the teaching, learning and preservation of Nigerian indigenous languages in higher education. The paper is anchored in Language Ecology Theory and the notion of digital linguistic inclusion, and draws on recent literature and empirical studies on Artificial Intelligence, language education, digital pedagogy and indigenous language revitalisation in Nigeria. Existing studies suggest that AI technologies, including generative AI, machine translation, speech recognition and text-to-speech systems, can offer new opportunities for instructional materials, language learning, documentation of endangered languages and increased access to indigenous-language resources. However, these opportunities are still limited by data scarcity, inadequate technological infrastructure, algorithmic bias, under-representation of Nigerian languages in large language models and the preponderance of global languages. The paper argues that if Nigerian languages are not deliberately incorporated into developing digital ecosystems, the uncritical acceptance of AI could exacerbate existing linguistic inequalities. It calls for greater collaboration between universities, linguists, technology developers, government and local language communities to develop datasets for Nigerian languages and culturally responsive AI applications.

Keywords: *Artificial Intelligence, Indigenous Languages, Nigerian Universities, Digital Pedagogy, Linguistic Inclusion, Language Ecology*

32. Artificial Intelligence as a Bridge: Rethinking Teacher Preparation for Digital Equity in Nigerian Higher Education

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The rapid proliferation of Artificial Intelligence (AI) technologies presents both an unprecedented opportunity and a pressing challenge for Nigerian higher education. While AI has demonstrated transformative potential in personalizing learning, automating assessment, and supporting pedagogical innovation, its equitable deployment requires a cadre of teachers who are digitally literate, critically informed, and pedagogically adept. This paper examines the role of AI as a bridging mechanism for closing the digital divide in Nigerian teacher education, with specific attention to pre-service and in-service teacher preparation programmes in higher institutions. Drawing on a theoretical framework that integrates Technological Pedagogical Content Knowledge (TPACK) and equity-centred pedagogy, the paper argues that AI integration in teacher preparation must be reimagined beyond tool adoption to encompass critical digital citizenship, inclusive design thinking, and contextually responsive instructional practice. The study draws on existing empirical literature, policy documents, and case analyses to propose a framework for AI-enhanced teacher preparation that addresses Nigeria's infrastructural constraints, socio-economic disparities, and diverse learning needs. Recommendations are offered for curriculum reform, faculty development, and institutional policy to reposition Nigerian higher education as a future-ready ecosystem.

33. Artificial Intelligence as a Catalyst for Adaptive and Future-Ready Learning in African Higher Education

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Artificial intelligence is increasingly positioned as a catalyst for reforming teaching, learning, and institutional practice worldwide. Yet in African higher education, AI's transformative potential remains constrained by fragmented adoption, weak infrastructure, and the absence of a unifying model linking technology to adaptive, future-ready learning. Existing literature documents distributed AI applications but offers no integrated framework explaining how AI can systematically drive adaptive learning across diverse African institutional contexts. This study addresses that gap by examining how AI functions as a catalyst for building future-ready learning ecosystems in African higher education. Using a scoping review guided by Arksey and O'Malley's (2005) framework, literature published between 2019 and 2026 was mapped across Scopus, ERIC, and African Journals Online. The study's core contribution is the Adaptive Digital Readiness Framework (ADRF), a conceptual model linking infrastructure, institutional policy, pedagogical innovation, and AI literacy as interdependent catalytic conditions for adaptive learning. Unlike prior studies that treat these factors separately, the ADRF models them as a dynamic system specific to resource-constrained settings. The study concludes that AI's catalytic potential depends on aligning these four dimensions, and recommends its adoption across African universities at varying digital maturity levels.

Keywords: *Artificial intelligence, catalyst, adaptive learning, future-ready, African higher education*

34. Artificial Intelligence as a Personalised Learning Tool for Diagnosing and Addressing Language Learning Difficulties in Higher Education

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Artificial Intelligence has increasingly transformed educational practices across the world, yet many higher institutions in Nigeria continue to experience persistent language learning difficulties among students, especially in pronunciation, grammar, vocabulary acquisition, writing competence, and oral communication skills. Conventional teaching approaches often fail to provide individualised support capable of addressing learners' unique academic challenges. This problem motivated the present study, which examines Artificial Intelligence as a personalised learning tool for diagnosing and addressing language learning difficulties in higher education institutions in Delta State, Nigeria. The study adopted a quantitative research design anchored on Siemens' Connectivism Theory (2005), which emphasises technology-driven learning, digital connectivity, and personalised knowledge construction within modern learning environments. The area of the study was Delta State, Nigeria, selected because of the increasing adoption of digital learning technologies in tertiary institutions within the state. The population of the study comprised 210 teachers and students drawn from selected higher institutions in Delta State. A stratified random sampling technique was employed to ensure adequate representation of both lecturers and students across the institutions. Data were collected using a structured questionnaire validated by experts in educational technology and language studies. The reliability of the instrument was established using Cronbach's alpha statistics. The mean and standard deviation were used to analyse the data and address the research questions. Findings revealed that Artificial Intelligence tools significantly improve personalised learning by diagnosing learners' language deficiencies, providing adaptive feedback, enhancing speaking and writing skills, and increasing learner engagement and academic performance. The study also identified inadequate digital infrastructure, poor internet connectivity, and insufficient AI literacy among educators as major constraints affecting implementation. The study concludes that Artificial Intelligence has substantial potential for improving language learning outcomes in higher education. The study recommends increased investment in digital infrastructure, ongoing training for educators, and institutional policies that support the integration of Artificial Intelligence into language instruction.

35. Artificial Intelligence Competencies and Digital Learning Ecosystems as Determinants of Workforce Readiness for Electric Vehicle Technology in Nigerian Higher Education

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The study examined artificial intelligence competencies and digital learning ecosystems as determinants of workforce readiness for electric vehicle technology among students in universities in South-South geopolitical zone, Nigeria. To achieve the objectives, four research questions and four hypotheses guided the study. Correlational research design was adopted for the study. The population comprised undergraduate students in Automobile Technology, Mechanical Technology and Industrial Technology Education in selected universities across the study area. Multistage sampling technique was used to select respondents from the participating universities. Data were collected using a structured questionnaire titled: Artificial Intelligence Competencies, Digital Learning Ecosystems and Workforce Readiness

Questionnaire (AICDLWRQ). The instrument was face-validated by experts in Industrial Technology Education, Measurement and Evaluation, while reliability was established using Cronbach Alpha reliability method. Research questions were analyzed using mean and standard deviation, while Pearson Product Moment Correlation and multiple regression analysis were used to test the hypotheses at 0.05 level of significance. Findings are expected to reveal the level of artificial intelligence competencies possessed by students, the availability and effectiveness of digital learning ecosystems and their influence on students' readiness for electric vehicle technology careers. The study will highlight the contribution of AI knowledge, digital learning resources, virtual simulation platforms and technology-enabled instructional environments toward developing future-ready technical graduates. The findings will provide evidence-based recommendations for universities, policymakers and industry stakeholders on measures to strengthen AI integration in technology education curricula, improve digital infrastructure, promote industry-academic collaboration and enhance students' competencies for emerging electric vehicle technologies.

36. Artificial Intelligence in Teaching and Learning: Opportunities and Challenges

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The emergence of Artificial Intelligence (AI) has significantly transformed the educational landscape, creating new opportunities for enhancing teaching and learning. As educational institutions increasingly embrace digital technologies, AI has become an important tool for improving instructional delivery, learner engagement, assessment practices, and educational management. This paper examines the opportunities and challenges associated with the integration of AI in teaching and learning. Drawing on contemporary literature and educational trends, the study explores applications such as intelligent tutoring systems, adaptive learning platforms, automated assessment tools, virtual learning assistants, and learning analytics. The paper argues that AI has the potential to improve education by supporting personalized learning experiences, enhancing teaching effectiveness, facilitating data-driven decision-making, expanding access to educational opportunities, and promoting inclusive learning for students with diverse needs. Despite these benefits, the adoption of AI in education presents several challenges, including concerns about data privacy, ethical issues, algorithmic bias, academic dishonesty, inadequate technological infrastructure, digital inequality, and limited digital skills among educators and learners. The paper highlights the need for educational institutions to develop appropriate policies and frameworks to guide the responsible and effective use of AI technologies. It emphasizes that AI should complement rather than replace educators, whose human qualities such as empathy, mentorship, creativity, and critical judgment remain essential in the teaching-learning process. The study concludes that while AI offers significant opportunities for educational innovation, its successful integration requires investment in infrastructure, continuous capacity building, ethical governance, and stakeholder collaboration. A balanced approach that combines technological advancement with sound pedagogical principles is recommended to ensure sustainable and equitable educational development in the digital age.

Keywords: *Artificial Intelligence (AI), Teaching and Learning, Educational Technology, Personalized Learning, Digital Education, Educational Innovation.*

37. Artificial Intelligence Tools and Their Influence on Students' Learning Engagement and Academic Performance in Higher Education: Evidence from Nigerian Universities

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The rapid advancement of Artificial Intelligence (AI) technologies has significantly transformed higher education globally, particularly through tools such as intelligent tutoring systems, adaptive learning platforms, automated assessment systems, and generative AI applications like ChatGPT. These technologies generate measurable educational data that are increasingly being used to assess student learning engagement and academic performance. This study adopts a secondary quantitative empirical research design by extracting and synthesizing numerical evidence from peer-reviewed empirical studies, conference papers, and institutional reports published between 2020 and 2026. Relevant studies were sourced from academic databases including Scopus, Google Scholar, ScienceDirect, and IEEE Xplore. Unlike traditional narrative reviews, this study systematically extracted quantitative indicators such as correlation coefficients, effect sizes, performance scores, and engagement metrics to construct a structured dataset for statistical analysis. The compiled dataset was analyzed using descriptive and inferential statistical techniques, including frequency distribution, correlation analysis, and comparative effect analysis, to determine the relationship between AI tool usage, student learning engagement, and academic performance in higher education. Findings from

the aggregated secondary data indicate that Artificial Intelligence tools have a statistically positive relationship with student engagement and academic performance. Specifically, AI-powered systems such as adaptive learning platforms and intelligent tutoring systems demonstrate stronger effects on behavioral, cognitive, and emotional engagement, which in turn contribute to improved academic outcomes. However, the analysis also reveals moderating challenges such as data privacy concerns, digital inequality, academic dishonesty, and infrastructural limitations that influence the effectiveness of AI integration in higher education. The study concludes that Artificial Intelligence technologies have a measurable positive impact on student engagement and academic performance when supported by adequate institutional infrastructure and ethical governance frameworks. The study recommends data-driven AI integration policies, improved digital infrastructure, and capacity-building programs for educators and students to ensure effective and responsible use of AI in higher education Keywords Artificial Intelligence, Educational Technology, Higher Education, Student Engagement, Academic Performance, Digital Learning

38. Artificial Intelligence, Fintech, and Blockchain for Transforming Accounting Education Towards Accounting 5.0 in African Higher Education

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The rapid advancement of Artificial Intelligence (AI), Financial Technology (FinTech), blockchain, and data analytics is transforming the accounting profession and redefining the competencies required of accounting graduates. However, many African higher education institutions continue to rely on traditional accounting curricula that provide limited exposure to emerging digital financial technologies and intelligent decision-support systems. This study examines the role of AI, FinTech, blockchain, and data analytics in transforming Accounting education for the Accounting 5.0 era. The objectives were to: (i) examine the relevance of emerging digital financial technologies in Accounting education; (ii) identify barriers to integrating AI, FinTech, blockchain, and data analytics into accounting curricula; (iii) evaluate their potential to enhance students' competencies in intelligent auditing, financial reporting, forensic accounting, digital taxation, and evidence-based decision-making; and (iv) propose a curriculum transformation framework aligned with Education 5.0, Accounting 5.0, and Smart Campus initiatives. The study adopts a qualitative review of contemporary literature, policy documents, and international best practices in digital accounting education. Findings indicate that integrating AI-powered accounting software, blockchain applications, predictive financial analytics, and digital auditing tools significantly enhances graduate employability, professional competence, innovation, and financial transparency while contributing to Sustainable Development Goals (SDGs), particularly SDG 4 and SDG 8. The study concludes that curriculum innovation, digital infrastructure investment, faculty capacity development, and stronger collaboration between higher education institutions, professional accounting bodies, and industry are essential for preparing accountants capable of leading Africa's digital financial transformation.

Keywords: *Accounting Education, Artificial Intelligence, FinTech, Blockchain, Data Analytics, Intelligent Auditing, Accounting 5.0, Education 5.0, Smart Campuses, Sustainable Development Goals (SDGs).*

39. Artificial Intelligence, Student Success and the Future of Higher Education in Africa: a Conceptual Framework for Building Inclusive and Resilient Learning Ecosystems

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Artificial Intelligence (AI) is rapidly transforming higher education by creating new opportunities for personalized learning, student support, and data-informed institutional decision-making. In Africa, however, higher education institutions continue to face challenges such as unequal access to digital resources, limited technological infrastructure, student attrition, and concerns regarding graduate preparedness for an increasingly digital economy. These challenges underscore the need for innovative approaches capable of fostering inclusive, resilient, and future-ready learning ecosystems. This paper examines the role of artificial intelligence in promoting student success and advancing the transformation of higher education in Africa. Drawing on contemporary literature and relevant theoretical perspectives, the paper explores how AI technologies can enhance learning experiences, improve student engagement, support academic achievement, and strengthen institutional responsiveness. Particular attention is given to the potential of AI-driven systems in personalized learning, predictive student support, adaptive assessment, and educational administration. The paper further discusses key barriers to AI adoption within African higher education, including infrastructural deficits, digital inequality, ethical concerns, data privacy issues, and institutional readiness. Based on these discussions, a conceptual framework is proposed to guide the development of inclusive and resilient

learning ecosystems that integrate digital infrastructure, institutional leadership, faculty capacity, student support mechanisms, and responsible AI implementation. The paper argues that the strategic and ethical integration of AI can significantly contribute to student success while supporting the long-term transformation and sustainability of higher education systems across Africa.

Keywords: *Artificial Intelligence, Student Success, Higher Education, Digital Transformation, Learning Ecosystems, Inclusion, Resilience, Africa.*

40. Artificial Intelligence-Driven Education Technologies for Competency-Based Teaching and Learning: Opportunities, Challenges, and Future Directions

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This study examined the influence of AI-powered adaptive learning systems, intelligent tutoring systems, and AI-based assessment tools on competency attainment, and learners' skill acquisition. A descriptive survey research design was adopted. The population comprised 985 students, 76 NCE students and 909 degree students of the Nigerian Army College of Education (NACOE), Ilorin. A sample size of 285 respondents was selected using the Krejcie and Morgan sample size determination table, while proportionate sampling technique was used to allocate the sample to the NCE and degree programmes, simple random sampling technique was employed to select the respondents from each category. A structured questionnaire with a reliability coefficient of 0.91 was used to collect data. Pearson Product Moment Correlation (PPMC) was employed to test the three hypotheses at the 0.05 level of significance. The findings revealed a significant positive relationship between AI-powered adaptive learning systems and competency attainment ($r = 0.721$, $p = 0.002$); intelligent tutoring systems and teaching effectiveness ($r = 0.689$, $p = 0.004$); and AI-based assessment and feedback tools and learners' skill acquisition ($r = 0.754$, $p = 0.001$). The results indicated that the corresponding coefficients of determination were 52.0%, 47.5%, and 56.9%, respectively, implying that the selected AI-driven educational technologies accounted for substantial variations in competency attainment, teaching effectiveness, and skill acquisition among the respondents. The study concluded that artificial intelligence-driven education technologies significantly enhance competency-based teaching and learning. Based on these findings, the study recommended, among others, that educational institutions should mainstream AI-driven learning technologies into classroom instruction.

Keywords: *competency-based learning, AI-powered adaptive learning systems, intelligent tutoring systems, AI-based assessment and feedback, skill acquisition*

41. Artificial Intelligence-Driven Pedagogy for Enhancing Practical Skills Acquisition Among Metalwork Technology Students in Nigerian Higher Education

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The growing rate of artificial intelligence (AI) in higher education presents significant opportunities for transforming practical instruction in technology education. Existing Nigerian studies have largely examined technology-enhanced teaching strategies, instructional methods, teacher AI readiness and frameworks for practical skills development, with little attention to the direct relationship between AI-driven pedagogy and practical skills acquisition among metalwork technology students. This study therefore examined artificial intelligence-driven pedagogy for enhancing practical skills acquisition among Metalwork Technology students in Nigerian Universities. To achieve the objectives of the study, four research questions and four null hypotheses guided the study. A correlational research design was adopted. The population comprised of undergraduate students of Metalwork Technology in South-south geopolitical zone, Nigeria. Multistage sampling procedure was employed to select the study participants. Data were collected using a researcher-developed instrument titled Artificial Intelligence-Driven Pedagogy and Practical Skills Acquisition Questionnaire (AIDPPSAQ). The instrument was validated by experts in Technology Education, Artificial Intelligence and Measurement and Evaluation, while reliability was established using the Cronbach Alpha method. Mean and standard deviation was used to answered the research questions, while Pearson Product Moment Correlation and multiple regression analysis tested the hypotheses at the 0.05 level of significance. The study is expected to show whether AI-supported simulations, intelligent tutoring systems, adaptive feedback and personalized learning significantly enhance students' practical competencies in metalwork technology. The findings will provide empirical data for curriculum innovation, lecturer capacity development and policy reforms aimed at integrating AI-driven pedagogy into technical and vocational education to strengthen industry-ready skills and sustainable technological

development in Nigeria.

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42. Artificial Intelligence-Supported Learning and the Development of Future-Ready Skills among Undergraduates in Public Universities in South-East Nigeria: Evidence from Enugu State

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The study investigated the relationship between artificial intelligence-supported learning and the development of future-ready skills among undergraduates in public universities in Enugu State, Nigeria. Four Research questions guided the study. A correlational survey design was adopted for the study. The study was carried out in Enugu State, Nigeria. The population of the study comprised approximately 86,000 undergraduate students in the University of Nigeria, Nsukka, and Enugu State University of Science and Technology. A sample of 400 undergraduates was selected using a multistage sampling technique involving purposive sampling, stratified sampling, proportionate sampling and simple random sampling. Data were collected using a researcher-developed questionnaire titled Artificial Intelligence-Supported Learning and Future-Ready Skills Questionnaire (AISFRSQ). The instrument was validated by three senior experts: two from the Educational Administration and Planning Unit, Department of Educational Foundations, and one from the Research, Measurement and Evaluation Unit, Department of Science Education, Faculty of Education, University of Nigeria, Nsukka, Enugu State, Nigeria. The reliability of the instrument was established using Cronbach's alpha, which yielded an overall reliability coefficient of 0.84. The instrument was administered to the respondents by the researchers with the assistance of trained research assistants, and the completed copies were retrieved, screened and analysed. Pearson Product-Moment Correlation and regression analysis were used to analyse the data, while a p-value less than 0.05 was regarded as significant. The findings showed that artificial intelligence-supported learning had a significant positive relationship with the development of future-ready skills among undergraduates. The findings further showed that artificial intelligence-supported learning significantly contributed to the development of future-ready skills among undergraduates. Based on the findings, it was recommended among other that university administrators and lecturers should strengthen the responsible integration of artificial intelligence-supported learning into teaching and learning to enhance the development of future-ready skills among undergraduates. The study contributed to knowledge by providing empirical evidence on the relationship between AI-supported learning and future-ready skills among undergraduates in public universities in Enugu State, thereby contributing to the growing body of knowledge on artificial intelligence and future-ready higher education in Nigeria and Africa.

Keywords: *Artificial intelligence, AI-supported learning, future-ready skills, undergraduates, higher education.*

43. Artificial Intelligence–Driven Edupreneurship for Digital Transformation in Nigerian Colleges of Education: Bridging the Digital Divide and Advancing a Future-Ready Teacher Education...

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Artificial Intelligence (AI) has become a transformative force in education, creating opportunities for innovation, entrepreneurship, and digital transformation in teacher education institutions. This paper examines the role of AI-driven edupreneurship in advancing digital transformation in Nigerian Colleges of Education and its potential to bridge the digital divide while promoting a future-ready teacher education ecosystem. Despite ongoing modernization efforts, many Colleges of Education continue to face challenges such as inadequate digital infrastructure, limited funding, outdated curricula, low technology adoption, and insufficient digital competencies among educators and student-teachers. These challenges hinder effective teaching and learning and limit institutional responsiveness to the demands of the digital age. The paper explores how AI-driven edupreneurial initiatives can facilitate institutional transformation through intelligent tutoring systems, personalized learning platforms, automated administrative processes, predictive analytics, and data-driven decision-making tools. These innovations can improve educational quality, enhance efficiency, expand access to learning opportunities, and promote inclusive education. The study further emphasizes the need for curriculum reforms that integrate AI literacy, digital pedagogy, computational thinking, and entrepreneurial skills into teacher education programmes. Continuous professional development is also identified as essential for equipping educators with the competencies required for effective technology integration.

Furthermore, the paper highlights the importance of supportive policies, strategic partnerships, and investment in digital infrastructure to ensure ethical, equitable, and sustainable AI adoption. It concludes that AI-driven edupreneurship provides a practical pathway for transforming Nigerian Colleges of Education into innovative and future-ready institutions capable of preparing teachers for the twenty-first-century digital economy.

Keywords: *Artificial Intelligence, Edupreneurship, Digital Transformation, Digital Divide, Future-Ready Education.*

44. Artificial Intelligent in the Political Science Classroom: Opportunities Challenges and Pedagogical Shift in African Universities

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Artificial Intelligence (AI) is rapidly transforming higher education, yet its implications for Political Science pedagogy in African universities remain largely unexplored. This paper examines the opportunities, challenges, and required pedagogical shifts for integrating AI into Political Science teaching across African universities. Drawing on a review of current literature and experiential insights from Nigerian university classrooms, the study identifies four key opportunities. First, AI tools such as chatbots and adaptive learning platforms enable personalized learning, allowing students to engage with complex concepts like comparative politics and international relations at their own pace. Second, AI-powered data analytics and visualization tools provide students real-time access to African political and electoral data, strengthening empirical research skills. Third, AI simulations of governance, policy-making, and conflict resolution offer experiential learning that is often limited by resource constraints. Fourth, generative AI expands students' access to global scholarship, bridging gaps in library resources.

Despite these opportunities, the paper identifies critical challenges: persistent digital infrastructure deficits and internet instability; algorithmic bias that underrepresents African political systems; concerns over data privacy, surveillance, and academic integrity; and limited faculty capacity for AI literacy. The study argues that effective adoption demands a pedagogical shift from AI as a substitute for instruction to AI as an augmentation tool that promotes critical, context-aware analysis.

The paper concludes by proposing a "Decolonized AI Pedagogy Framework" for African Political Science. This framework prioritizes localization of datasets, ethics-centered instruction, faculty development, and policy alignment to ensure AI strengthens the teaching of African governance and political realities rather than reproducing external biases.

Keywords: Artificial Intelligence; Political Science Education; African Universities; Pedagogy; Decolonization; Digital Divide

45. Asam-C Curriculum on AI Sustainability and Management: a Likely Contribution to Global AI Development and Application

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The advent of AI has transformed the entire horizon of human civilization and higher education in Africa is no exception. AI has been deployed in sciences and humanities with tremendous consequences and overwhelming time and cost saving results. However, there are concerns on ethical issues, workforce redundancy, safety, consistency, reliability and several others as AI continues to impact the world. Evolving AI technologies are a driver of continuous innovation in the multidimensional context of teaching, academic research, and institutional governance. Their use requires responsible regulation to prevent expansion in socio-economic divergence, ethical oversights, algorithmic prejudice, and critical environmental impact on immediate university communities. What Africa requires at this juncture is a comprehensive postgraduate blueprint that proffers solutions to these challenges while addressing ethical considerations, technical capabilities, responsiveness to the environment and social equity. This paper underscores the importance of developing a well-defined academic landmark on the continent. Given a formal template, building scholars, policymakers, and university leadership with cognate skills on the complete AI lifecycle, our tertiary institutions can develop enduring and accountable information networks. The main academic concentration should be on energy conservative algorithmic models, impartial digital access, data privacy, and suitable compliance contextualized to the developmental realities of the African continent. Moreover, the infusion of AI sustainability management into postgraduate studies engenders compliance of university education with the Sustainable Development Goals (SDGs) and global Environmental, Social, and Governance (ESG) frameworks. It equips

academic and industry leaders of tomorrow with transformative foresight to convert incipient technology into a tool for holistic economic growth instead of digital divergence. This paper also outlines cornerstone templates for developing and implementing these postgraduate programmes. The paper further portrays how interdisciplinary curricula encourage vital collaboration among academia, tech industry leaders, and continental governance partners. The AI sustainability advanced management curriculum offers a proactive approach that guarantees digital innovation in African higher education that is ethically sound, environmentally viable, and structurally inclusive for future generations.

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Keywords: *AI Sustainability Advanced Management Curriculum (ASAM-C), Higher Education in Africa, Digital Divergence, Sustainable Development*

46. Assessessment of Future Learning in the Era of Digital Innovation in Colleges of Education in North-Eastern Nigeria

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This study assessed future learning in the era of digital innovation in Colleges of Education in North-Eastern Nigeria. The study was guided by three objectives, to examine the level of digital innovation adoption, determine the influence of digital innovation on future learning and examine the challenges affecting digital innovation adoption. A sample size of 246 respondents comprising lecturers and students was selected using stratified and simple random sampling techniques and data collected were analyzed using mean and standard deviation, with a criterion mean of 3.00 for decision-making. The findings revealed that the grand mean score of 3.23, indicating that digital innovation adoption is at a moderate level, however, internet adequacy and AI-supported technologies recorded low ratings. The study further revealed a grand mean of 3.81, indicating that digital innovation significantly influences future learning. The results show that all the identified challenges recorded mean scores above the criterion mean of 3.00 WITH unstable electricity supply had the highest mean score (M = 4.25, SD = 0.58), indicating that respondents perceived it as the most critical challenge affecting the implementation of digital technologies. This was followed by poor internet connectivity (M = 4.18, SD = 0.63) and inadequate ICT infrastructure (M = 4.12, SD = 0.66 and insufficient funding recorded a high mean score (M = 4.07, SD = 0.72). The respondents also agreed that the high cost of digital technologies (M = 3.94, SD = 0.79) and the lack of technical support personnel (M = 3.88, SD = 0.77) constitute major barriers to digital innovation adoption. Furthermore, limited digital competence among lecturers (M = 3.71, SD = 0.81) and resistance to technological change (M = 3.54, SD = 0.88) were accepted as challenges. Based on the findings, the study concluded that digital innovation is a critical driver of future learning and has significant potential to improve teaching and learning. The study recommended increased investment in ICT infrastructure, provision of reliable internet services, continuous training of lecturers and students, integration of emerging technologies into educational practices, and strengthened policy implementation to support digital transformation in Colleges of Education.

47. Awareness and Preparedness of Students Towards the Adoption of Artificial Intelligence for Learning Science Education Courses in the College of Education, Billiri

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This study examined students' awareness and preparedness to adopt artificial intelligence (AI) for learning Science Education courses at the College of Education, Billiri. A descriptive cross-sectional survey design was adopted, and stratified random sampling was used to select 150 students from six Science Education areas. Data were collected using a validated questionnaire (Reliability coefficient = 0.72) and analysed using descriptive statistics, including frequency counts, percentages, mean and standard deviation. A criterion mean of 2.50 was used as the decision-making benchmark. Findings revealed that students generally demonstrated favourable awareness of AI and positive attitudes towards its use in Science Education. The study also indicated a favourable level of self-reported preparedness to use AI as a learning resource. However, students' practical experience with AI-powered tools was comparatively limited. The study recommends integrating AI literacy into Science Education programmes, providing practical training for students, and improving access to digital learning facilities to support the responsible adoption of AI in learning.

48. Beyond the Digital Divide: African Languages, Cultures, and Equity in Ai-Enabled Higher Education

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Higher education has been the scene of a profound transformation due to the rapid integration of artificial intelligence (AI), which affects teaching, learning, research, assessment, and knowledge production. It is observed that most AI systems are developed and trained predominantly on data from English and many other high-resource languages with great digital representation. Meanwhile, the vast African linguistic and cultural heritage is either poorly represented or completely left out from these datasets, natural language processing (NLP) systems, educational technologies, and generative AI applications. This situation presents the risk of creating a new form of digital inequality in which African academics and students may have access to AI technologies, but not an equitable access to AI that adequately recognises their languages, cultures, identities, and knowledge systems. Therefore, this conceptual paper examines the implications of digital and linguistic divide in African higher education. Building on researches in digital humanities, language technology, African language studies, and decolonial approaches to knowledge production, the paper explores three interrelated issues: the technical marginalization of African languages in natural language processing systems; the cultural and pedagogical consequences of using AI tools that do not reflect Africa's linguistic diversity, oral traditions, and local knowledge system; and the structural challenges that include unlimited infrastructure, inadequate funding, and weak policy support that shape unequal access to AI-enabled learning environments across the continent. In other words, digital inclusion should be understood not merely as access to technology but also as meaningful participation in the linguistic and cultural architecture of digital knowledge. The paper further considers emerging initiatives, such as multilingual corpus development and locally developed language models, that aim to address these challenges and improve the representation of African languages in AI technologies. In conclusion, the paper affirms that African universities need policies and pedagogical practices that position African languages and knowledge systems not as peripheral additions to digital education but as essential components of an equitable and future-ready higher education ecosystem. This calls for sustained collaboration between technologists, educators, and language communities to ensure that AI-enabled higher education serves rather than sidelines Africa's linguistic and cultural heritage.

Keywords: African languages, artificial intelligence, cultural diversity, digital divide, decolonisation, higher education, linguistic equity, digital inclusion.

49. Beyond the Physical Laboratory: Harnessing Virtual Reality, Artificial Intelligence, and the Metaverse for Chemistry Learning in North-West Nigeria

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The rapid advancement of digital technologies is transforming higher education globally, creating new opportunities for innovative teaching and learning. In chemistry education, the traditional dependence on physical laboratories has long constrained access to practical learning, particularly in developing regions where inadequate infrastructure, limited laboratory facilities, insufficient funding, and shortages of qualified personnel remain significant challenges. This study investigates the potential of Virtual Reality (VR), Artificial Intelligence (AI), and Metaverse technologies in transforming chemistry learning within higher education institutions in North-West Nigeria. Using empirical data sourced from UNICEF databases and related educational statistics, the study examines the extent to which digital technologies can bridge existing educational inequalities and support future-ready higher education ecosystems. The study focuses on seven states in North-West Nigeria: Kaduna, Kano, Katsina, Jigawa, Kebbi, Sokoto, and Zamfara. The research adopts a quantitative descriptive design utilizing secondary data obtained from UNICEF Multiple Indicator Cluster Surveys (MICS), UNICEF Digital Learning Reports, and educational development statistics. The study evaluates digital access indicators, educational participation rates, ICT literacy levels, and institutional readiness for digital transformation. Findings are revealed substantial disparities in digital access and educational opportunities across the region, while simultaneously demonstrating the transformative potential of immersive technologies in improving chemistry teaching, practical experimentation, conceptual understanding, and learner engagement. The paper argues that AI-driven personalized learning systems, VR-enabled virtual laboratories, and Metaverse-based collaborative learning environments can significantly reduce barriers to practical chemistry education, particularly in underserved communities. The study concludes that strategic investments in digital infrastructure, teacher capacity development, policy support, and public-private partnerships are necessary for the successful integration of emerging technologies

into chemistry education in North-West Nigeria and Africa at large.

Keywords: *Artificial Intelligence, Virtual Reality, Metaverse, Chemistry Education, Digital Innovation, Digital Divide, Higher Education, North-West Nigeria.*

50. Bridging Digital Inequalities in History Education in Nigeria through Artificial Intelligence and Emerging Technologies: Pathways to Future-Ready Learning

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The increasing adoption of Artificial Intelligence (AI) and emerging technologies in education has transformed instructional practices and expanded opportunities for innovative learning across disciplines. However, persistent digital inequalities continue to limit equitable access to these technological advancements, particularly within History Education in Nigeria. This paper examines the potential of AI and emerging technologies to address digital disparities and promote future-ready learning in History Education. Adopting a conceptual and analytical approach, the paper draws on contemporary literature, policy documents, and global best practices in educational technology integration. It explores the application of AI-powered tools, virtual reality environments, digital archives, intelligent tutoring systems, learning analytics, and interactive multimedia platforms in enhancing the teaching and learning of History. The paper identifies critical barriers to effective technology integration, including inadequate digital infrastructure, limited internet connectivity, insufficient funding, low levels of digital competence among teachers, and unequal access to technological resources among learners. These challenges contribute to disparities in educational opportunities and learning outcomes across different socio-economic and geographical contexts. The paper further argues that the strategic deployment of AI and emerging technologies can enhance historical inquiry, critical thinking, digital literacy, learner engagement, and collaborative learning while making historical content more accessible and relevant to contemporary learners. It emphasizes the need for targeted investments in digital infrastructure, teacher professional development, curriculum innovation, and supportive policy frameworks to facilitate effective technology adoption. The paper concludes that bridging digital inequalities in History Education is essential for fostering inclusive and future-ready learning environments capable of equipping learners with the knowledge, competencies, and digital skills required for meaningful participation in the twenty-first-century knowledge society.

Keywords: *History Education, Artificial Intelligence, Emerging Technologies, Digital Inequalities and Future-Ready Learning.*

51. Bridging Policy and Practice: Responsible AI Governance and Employees' Acceptance of Artificial Intelligence Technologies in Colleges of Education in Nigeria

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Artificial Intelligence (AI) has emerged as one of the greatest revolutionary technologies of the twenty-first century, restructuring organizational procedures, decision-making system and service delivery across sectors including education. This study investigated responsible AI governance and employees' acceptance of artificial intelligence technologies in Colleges of Education in Nigeria. The study employed a descriptive survey research design. The population comprised all colleges of education in the North Central region of Nigeria. There are 32 Colleges of Education in the region [1]. A sample of 594 staff (Academic and non-academic) were involved in the study, they were selected by adopting multi-stage approach. A questionnaire titled Responsible AI Governance and AI Acceptance Questionnaire (RAIGAQ) designed by the researcher, validated through expert judgment and used for data collection. The instrument was further pilot tested to ascertain the reliability through a test-retest method, and a reliability index of 0.76 was established. A descriptive statistics was applied to answer the four research questions put forward to guide the study, while Pearson Product Moment Correlation was used to test the hypothesis. The results indicated that the level of implementation of responsible AI governance was low, however, a high level of employees' acceptance of AI technologies was established. Some of the challenges found to hinder the implementation of responsible AI governance in Colleges of Education in Nigeria include: inadequate policies, poor infrastructure, insufficient funding, limited AI experts, weak regulatory framework, ethical issues, and poor internet connectivity. The study recommended that coordinated efforts should be made by the National Commission for Colleges of Education (NCCE), the federal and states Ministry of Education, technology experts and other stake holders to develop robust governance frameworks that promote ethical, transparent and accountable AI use in teacher education.,

Keywords: *Artificial Intelligence, Responsible AI Governance, Acceptance, AI Technologies.*

52. Bridging the Digital Divide and Reimagining a Future-Ready Higher Education Ecosystem in Africa

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This study examined bridging the digital divide and reimagining a future-ready higher education ecosystem in Africa. The study specifically investigated the influence of the digital divide, research activities, digital infrastructure, digital literacy and capacity-building programmes, and artificial intelligence and emerging technologies on the development of a future-ready higher education ecosystem in Africa. Five research questions and five null hypotheses guided the study. The study adopted a quantitative survey research design. The population comprised academic staff, administrative staff, researchers, and students drawn from selected higher education institutions across Africa. A sample of 340 respondents was selected using appropriate sampling techniques. Data were collected through a structured questionnaire titled Bridging the Digital Divide and Future-Ready Higher Education Ecosystem Questionnaire (BDD-FRHEEQ). The instrument was validated by experts in Educational Management and Measurement and Evaluation, while its reliability was established using the Cronbach Alpha reliability method. Data collected were analyzed using multiple regression analysis at the 0.05 level of significance. The findings revealed that the digital divide significantly influenced higher education institutions in Africa ($\beta = -0.524$, $t = -11.326$, $p < 0.05$), indicating that increasing digital inequalities negatively affect institutional effectiveness and development. Research activities significantly influenced digital transformation and innovation in higher education institutions ($\beta = 0.614$, $t = 11.957$, $p < 0.05$). Digital infrastructure significantly influenced the development of a future-ready higher education ecosystem ($\beta = 0.689$, $t = 15.561$, $p < 0.05$). Digital literacy and capacity-building programmes significantly influenced digital inclusion among university stakeholders ($\beta = 0.587$, $t = 11.867$, $p < 0.05$). Furthermore, artificial intelligence and emerging technologies significantly influenced future readiness in African higher education institutions ($\beta = 0.731$, $t = 17.205$, $p < 0.05$) and emerged as the strongest predictor of future readiness. Based on the findings, the study concluded that bridging the digital divide is fundamental to the development of a future-ready higher education ecosystem in Africa. The study further concluded that investments in digital infrastructure, research and innovation, digital literacy and capacity-building programmes, and the adoption of artificial intelligence and emerging technologies are critical for enhancing institutional resilience, inclusiveness, competitiveness, and sustainable development. The study recommended increased investment in digital infrastructure, expansion of digital inclusion initiatives, strengthening of research activities, continuous digital skills development programmes, and greater integration of emerging technologies within higher education institutions across Africa.

Keywords: *Digital Divide, Future-Ready Higher Education Ecosystem, Digital Infrastructure, Research Activities, Digital Literacy, Capacity Building, Artificial Intelligence, Emerging Technologies, Digital Inclusion, Higher Education in Africa*

53. Bridging the Digital Divide in African Higher Education: Digital Inclusion Strategies for the Advancement of Physical and Health Education in Future-Ready and Sustainable Educational...

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The rapid growth of digital technologies has changed how knowledge is developed, shared and applied in higher education. Despite these developments, many higher institutions across Africa still face challenges arising from unequal access to digital infrastructure, technological resources and the skills needed to use them effectively. These challenges are particularly relevant to Physical and Health Education (PHE), a field that depends largely on practical instruction, active participation, sports activities and health-related learning experiences. This paper explores the digital divide in African higher education, focusing on how digital inclusion can support the advancement of Physical and Health Education and prepare the discipline for a more sustainable, technology-driven future. Using a conceptual approach, the paper draws on existing literature and institutional reports to examine the role of digital technologies in five key areas of Physical and Health Education: teaching and learning, research and academic development, sports management and administration, health promotion and wellness education, and physical fitness assessment and monitoring. It also discusses some of the major obstacles affecting digital adoption in African institutions, including inadequate infrastructure, unreliable electricity supply, high internet costs, limited digital skills, unequal access to technological resources and concerns surrounding data privacy. The discussion is guided by the Expanded Digital Divide Theory, which explains that digital inequality goes beyond whether individuals have access to technological devices or internet facilities. It also involves differences in digital skills, how technology is used and the benefits people

are able to gain from it. From this perspective, the paper argues that improving digital access in Physical and Health Education requires more than simply providing computers and internet connections. Institutions must also invest in digital infrastructure, equip lecturers with relevant technological skills, make internet access more affordable, provide inclusive digital learning platforms, encourage research partnerships and establish policies that support responsible technology use. Digital literacy must also become an integral part of PHE programmes. To address these concerns, the paper proposes a Physical and Health Education Digital Inclusion Framework built around five interconnected areas: infrastructure, human capacity, pedagogical innovation, institutional support and equitable participation. It concludes that digital inclusion offers significant opportunities to improve the quality, relevance and long-term sustainability of Physical and Health Education in African higher institutions. However, these benefits can only be fully realised when technology is used to support, rather than replace, practical learning, encourage physical activity and strengthen professional competence.

Keywords: *Digital divide, digital inclusion, Physical and Health Education, African higher education, artificial intelligence, educational technology, sustainability.*

54. Bridging the Digital Divide in Mathematics Education: Reimagining Future-Ready Technology-Enhanced Learning Ecosystems in African Higher Education Institutions

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Digital technologies are changing the nature of higher education, offering opportunities for interactive, personalized and flexible learning. But access to digital infrastructure, technological resources, and digital competences remains unequal in many HEIs in Africa, preventing the effective use of technology in mathematics' teaching. The study focused on the effect of digital infrastructure, digital literacy, and use of artificial intelligence (AI) and institutional support on future ready digital technology-enhanced learning ecosystems in Mathematics Education in tertiary institutions in the Niger Delta region of Nigeria. The study targeted twelve institutions which included universities, polytechnics and colleges of education in Edo, Delta, Bayelsa and Rivers States. A synthetic sample of 2,280 students, lecturers, and administrators were used to create and validate an extensive digital readiness and mathematics learning outcomes model. Descriptive statistics, multiple regression, mediation and moderation analysis and structural equation modelling were used to analyze the data. Results showed that institutional support, digital literacy, AI use and digital infrastructure were significant predictors of the effectiveness of technology-enhanced mathematics learning ecosystems. Results also indicated that digital learning environments that were well developed positively impacted student engagement, mathematics achievement, and future ready skills. The study suggests that to reduce the digital divide in math education, investments in the digital infrastructure, AI integration, digital skills development, and supportive institutional policies are needed. The efforts are crucial to establishing an inclusive and sustainable learning environment that can equip students with the skills required to meet the needs of the digital age.

55. Bridging the Digital Divide through Game-Based Language Learning: Designing a Child-Friendly Mobile Application to Enhance English Proficiency and Promote Learner Retention in Nigerian...

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English serves as the official language of instruction in Nigeria, yet many pupils in basic education struggle with limited English proficiency, which negatively affects academic achievement, classroom participation, and school retention. Conventional teaching approaches often fail to provide engaging and inclusive learning experiences, particularly in resource-constrained schools where access to innovative digital learning tools remains limited. This challenge underscores the need for technology-driven pedagogical innovations capable of supporting language development while addressing educational inequalities. This study presents the conceptual design and evaluation framework of LexiPlay, a child-friendly, game-based mobile application developed to improve English vocabulary acquisition and language skills among pupils in Nigerian basic schools. Employing a Design-Based Research (DBR) methodology, the study will be conducted in three phases. The first phase involves a needs assessment using questionnaires and focus group discussions with 120 pre-service teachers and teacher educators drawn from four Colleges of Education in Nigeria to identify learners' language difficulties and digital instructional needs. The second phase focuses on designing the LexiPlay prototype, integrating gamification features such as interactive storytelling, voice-assisted pronunciation, adaptive quizzes, reward systems, and offline functionality to enhance accessibility in low-connectivity

environments. The final phase examines pre-service teachers' digital competence, perceived usefulness, and intention to integrate the application into English language instruction. The study is expected to provide a practical framework for integrating game-based digital innovations into teacher education programmes, thereby equipping future educators with effective strategies for improving English language learning, reducing educational disparities, and promoting learner retention in Nigerian basic education. The findings will contribute to ongoing discussions on building inclusive, future-ready educational ecosystems across Africa.

56. Bridging the Digital Divide with AI and Emerging Technologies:Reimagining Future-Ready Graphic Design Education in Africa

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Artificial Intelligence (AI) and other emerging technologies are transforming education and skill practice across various disciplines. And Graphic design education across Africa stands at a decisive crossroads. This opinion paper examines the influence of AI-driven tools, virtual and augmented reality, machine learning, and digital collaboration platforms on the future of learning within Graphic design education. It also argues that AI, if reimagined for Africa's specific realities, can bridge the continent's digital design divide by enabling sophisticated visual production via low-cost smartphones, Etc. The emerging technologies present significant opportunities for enhancing creativity, personalization, accessibility, and skill development among learners. Nevertheless, concerns regarding overdependence on automated systems, ethical issues, originality, potential reduction of critical design thinking and infrastructural deficits are also discussed. Using graphic design education as a case study, the paper explores how educators and institutions can adapt curricula, teaching methods, and assessment strategies to prepare students for a rapidly evolving digital landscape. The paper concludes that while AI and emerging technologies are powerful catalysts for innovation, their successful integration into graphic design education requires a balanced approach that combines technological proficiency with human creativity, critical thinking, and ethical responsibility as a bridge toward a more equitable and distinctly African future for Graphic Design education. The paper further proposes a set of strategic recommendations for institutions, policymakers, and design educators committed to building future-ready, globally competitive, and culturally grounded graphic design programmes in Africa.

Keywords: *AI, graphic design education, African higher education, digital divide, future-ready pedagogy, Afrocentric Education*

57. Challenges of Integrating Emerging Technologies in Curriculum Implementation in College of Education,gindiri

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This study investigated the challenges of integrating emerging technologies in curriculum implementation at the College of Education, Gindiri, Plateau State, Nigeria. The rapid evolution of emerging technologies presents both opportunities and significant hurdles for higher education institutions, particularly teacher training colleges, in effectively embedding these tools into their teaching and learning processes. The primary objectives were to identify the specific emerging technologies available or desired, ascertain the perceived challenges faced by educators and students, and determine the extent to which these technologies are currently integrated. A descriptive survey research design was adopted. The population comprised educators at the College, with a sample selected via stratified random sampling. Data was collected using a 4-point Likert scale structured questionnaire and analyzed using simple percentages. Key findings indicate a significant lack of adequate infrastructure, including reliable power supply and internet connectivity, as the most pressing challenge. Other major challenges include insufficient funding for technology acquisition and maintenance, a deficit in requisite technical skills and continuous training for educators, and resistance to change or negative attitudes towards technology adoption. While some technologies like basic computing and projectors are used, the integration of advanced emerging technologies (VR, AR, AI) is minimal. Recommendations include substantial government and institutional investment in infrastructure and funding, comprehensive and continuous professional development for educators, and the development of clear institutional policies to guide technology integration.

Keywords: *Emerging Technologies, Curriculum Implementation, Higher Education, Teacher Education, Integration Challenges, College of Education Gindiri.*

58. ChatGPT in the Lecture Hall: How Generative AI Is Already Changing the Way African Students Learn — and What Educators Should Do About It

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Generative AI tools, led by ChatGPT, have moved from novelty to everyday study companion for students across African universities and colleges of education in barely three years, yet institutional policy, pedagogy, and lecturer practice have struggled to keep pace. This paper presents an observational, practice-based discussion of how generative AI is already reshaping student learning behaviour in African higher education classrooms — from assignment drafting and exam preparation to concept explanation and language support — drawing on direct classroom experience as a computer science educator. Rather than treating generative AI purely as an academic-integrity threat, the paper examines the tension lecturers now face between policing AI use and harnessing it as a legitimate learning aid, and argues that the more urgent task is redesigning assessment and pedagogy rather than banning the tool. Three practical directions are proposed for educators and institutions: redesigning assessments to reward reasoning and process over easily-generated final answers; explicitly teaching AI literacy so students use these tools critically rather than passively; and developing clear, realistic institutional guidelines that reflect how students are actually using AI rather than how policy assumes they should. The discussion closes with reflections on what this shift means for teacher training, curriculum design, and the broader goal of building future-ready, digitally-literate higher education ecosystems in Africa.

59. Design and Implementation of an Automated Penetration Testing Tool for IoT Networks in Smart Home Environments

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Internet of Things (IoT) devices have developed exponentially over time to become highly essential to modern smart home ecosystems, enabling automated control of security systems, lighting, climate regulation, and other critical infrastructure. Many homes are remotely controlled and secured depending strictly on Internet of Things enabled devices. However, taking into cognizance the proliferation of IoT devices, significant security challenges have arisen with weaknesses ranging from insecure default credentials, vulnerable and open ports to device hijacking and ransomware exploitation. This research attempts to address these susceptibilities by designing and applying an automated penetration testing tool specifically tailored for IoT networks in smart home environments. The proposed system comprises of five main modules: (1) a network discovery engine that utilizes ARP scanning and numbering of ports to identify IoT devices, (2) a weakness assessment module that targets four critical vulnerability categories—open ports, weak/default credentials, device hijacking, and ransomware vectors—(3) a payload injection and exploitation module for active vulnerability validation, (4) a reporting mechanism that generates comprehensive findings in various formats, and (5) a remedy guidance system that provides actionable recommendations for vulnerability mitigation. The tool is applied using Python with auxiliary technologies including Scapy for network operations, python-nmap for enumeration of services, Paramiko for SecureShell credential testing, and a Node.js/Express.jWs backend with React.js frontend for visualizing dashboards. It was demonstrated that testing on a Docker-based smart home testbed showed the tool's usefulness in identifying the practical vulnerabilities of IoT. This computerized approach achieved 95% detection accuracy while significantly reducing manual testing time by 80%, signifying the practical value of automated penetration testing in IoT security validation. This research contributes a functional open-source tool as well as a comprehensive framework for IoT vulnerability assessment which aligned with the OWASP IoT Top 10.

60. Developing a Framework for Sustainable AI-Enabled Library Services in Nigerian Colleges of Education

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Artificial Intelligence (AI) is rapidly transforming education through emerging learning technologies, evolving education models, intelligent information systems, and new approaches to global knowledge sharing. This conceptual paper focuses on Colleges of Education in Nigeria, where libraries are expected to respond to technological changes by providing more accessible, personalised, efficient, and responsive services to support teaching, learning, and research.

The paper aims to develop a framework for sustainable AI-enabled library services in Nigerian Colleges of Education. Specifically, the paper: (1) systematically reviews and synthesizes existing literature on the application of Artificial Intelligence in academic and teacher-education libraries globally and in Nigeria; (2) identifies and examines the various dimensions of AI-enabled library services applicable to Colleges of Education; and (3) proposes and develops an integrated framework for sustainable AI-enabled library services in Nigerian Colleges of Education. The study adopts a systematic literature review approach, guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework. Relevant peer-reviewed journal articles, conference papers, scholarly books, and authoritative institutional reports published in English were identified through major academic databases and selected based on their relevance to AI adoption, academic and teacher-education libraries, library service delivery, educational technology, and sustainable technology integration. Studies were screened using predefined inclusion and exclusion criteria, with relevant evidence synthesised thematically to identify the major dimensions and relationships required for sustainable AI adoption. The Technology–Organisation–Environment (TOE) framework provides the principal theoretical foundation, complemented by perspectives on responsible AI and technology sustainability. The proposed framework integrates technological readiness, organisational capacity, human competencies, ethical and responsible AI governance, financial and institutional sustainability, user-centred service innovation, and continuous evaluation and adaptation. The paper demonstrates how these interrelated dimensions can guide the responsible and sustainable integration of AI into library services in Nigerian Colleges of Education. The resulting framework is expected to provide librarians, educational administrators, policymakers, and researchers with a context-sensitive basis for planning, implementing, evaluating, and sustaining AI-enabled library services that support evolving education models, enhance learning and research, and strengthen participation in global knowledge sharing.

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61. Developing Inclusive Curriculum in the Artificial Intelligence Era for Diverse Learners

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The rapid integration of artificial intelligence (AI) into education is transforming curriculum development, teaching methods, assessment systems, and learner engagement across the world. While AI technologies offer significant opportunities for personalized learning, accessibility, and educational efficiency, they also present challenges related to equity, bias, exclusion, and digital inequality. This paper explores the development of inclusive curriculum in the AI era for diverse learners. Drawing on frameworks such as Universal Design for Learning (UDL), differentiated instruction, and culturally responsive pedagogy, the paper argues that inclusive curriculum must intentionally address learner diversity from the beginning of the design process. The discussion examines the role of AI in supporting learners with different abilities, languages, cultures, and socioeconomic backgrounds while also highlighting ethical concerns such as algorithmic bias, privacy, and overdependence on automated systems. In addition, the paper presents practical strategies for curriculum design, assessment, and teacher preparation in AI-enhanced learning environments. The study concludes that inclusive curriculum development in the AI era requires a balance between technological innovation and human-centered educational values. Educators, policymakers, and curriculum developers must ensure that AI serves as a tool for equity and empowerment rather than exclusion.

62. Development of an Explainable Machine Learning Framework for the Detection, Classification, and Predictive Prioritization of Dietary Phytoconstituents with Tumor-Preventive Potential

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Existing research on dietary phytoconstituents often treats compound detection, classification, and bioactivity assessment as separate tasks, limiting reproducibility, interpretability, and systematic prioritization for tumor prevention studies. This study aims to develop and evaluate an explainable machine learning framework for detecting, classifying, and prioritizing dietary phytoconstituents with tumor preventive potential through the integration of phytochemical, molecular descriptor, physicochemical, and bioactivity data. A computational experimental design will be carried out using publicly available datasets curated from dietary and medicinal plant sources based on predefined inclusion criteria such as compound identity, chemical structure or SMILES notation, availability of descriptors, phytochemical class and relevant bioactivity indicators. Data preparation will include duplicate removal, missing value

treatment, molecular descriptor generation, feature engineering and dataset partitioning. Supervised machine learning models including Random Forest, Support Vector Machine, Gradient Boosting, XGBoost, Artificial Neural Networks and Graph Neural Networks will be trained and compared. Model performance will be assessed using accuracy, precision, recall, F1-score, ROC-AUC, confusion matrix analysis and cross-validation. Explainable AI methods particularly SHAP and LIME will be used to identify influential molecular descriptors, phytochemical properties and bioactivity features. The anticipated outcome is an interpretable and reproducible AI framework to assist in phytoconstituent screening, prediction and prioritization for subsequent experimental studies

63. Digital Access, Higher Education and Youth Employment in Africa

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Africa is experiencing rapid growth in its youth population, yet the expansion of productive employment opportunities remains insufficient to absorb the increasing number of young people entering the labour market. At the same time, digital technologies are transforming higher education, skills acquisition and labour market participation. Digital access can facilitate online learning, improve access to employment information, support digital skills development and create opportunities for participation in emerging digital economic activities. However, unequal access to digital infrastructure may limit the capacity of higher education to translate educational attainment into improved employment outcomes. This study examines the relationship between digital access, higher education and youth employment in Africa, with particular emphasis on whether digital access enhances the employment benefits of higher education. The study employs panel data for 20 selected African countries covering the period 2000 to 2024. Digital access is measured using internet usage and mobile connectivity indicators, while higher education is proxied by tertiary education enrolment., other control variables such as GDP per capita is also included to capture the level of economic activity in African countries. Youth employment is measured using the youth employment to population ratio. The study employs panel econometric techniques; Descriptive statistics, Correlations Matrix and Panel ARDL to examine the direct and interactive short and long-run relationship that exists between digital access, higher education and youth employment in Africa. While FMOLS will be used as the robustness check. The study is expected to contribute to the literature by examining digital connectivity and higher education jointly rather than treating them as separate determinants of youth employment. The findings will provide policy insights into digital infrastructure investment, higher education development, digital skills acquisition and youth employment strategies in African economies. The study argues that expanding access to digital technologies alongside higher education may strengthen young people's capacity to participate effectively in an increasingly digital labour market.

Keywords: *Digital access, higher education, youth employment, digital skills, Africa's labour market.*

64. Digital Green Advocacy: Assessing the Impact of Social Media on Environmental Education in Nigeria

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Environmental education and green advocacy have become essential tools for promoting environmental sustainability in Nigeria amid growing concerns about climate change, pollution, deforestation, and resource depletion. This study examines the role of social media in enhancing environmental education and supporting green advocacy initiatives across the country. Social media platforms such as Facebook, X (formerly Twitter), Instagram, WhatsApp, and YouTube provide accessible channels for disseminating environmental information, raising public awareness, and mobilizing citizens toward environmentally responsible behaviors. Through digital campaigns, online discussions, and community engagement, environmental organizations, educators, and activists have leveraged social media to influence public attitudes and encourage participation in environmental conservation activities. The study highlights the opportunities presented by social media in reaching diverse populations, particularly young people, while also identifying challenges such as misinformation, limited internet access, and low digital literacy in some communities. The findings suggest that effective integration of social media into environmental education and advocacy strategies can significantly contribute to environmental awareness, public participation, and sustainable development in Nigeria. The study recommends stronger collaboration among government agencies, educational institutions, and civil society organizations to maximize the potential of social media for environmental sustainability. Keywords: Environmental Education, Green Advocacy, Social Media, Sustainability and Digital

65. Digital Inclusion, Equity and Access to Emerging Technologies in Higher Education: Implications for Educational Management and Sustainable Human Capital Development in Nigeria

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The rapid advancement of digital technologies is transforming educational systems globally, yet significant disparities in access, utilization, and digital participation continue to widen educational inequalities, particularly in developing countries. This paper examines digital inclusion, equity, and access to emerging technologies in higher education and explores their implications for educational management and sustainable human capital development in Nigeria. The study is anchored on the Digital Divide Theory and Equity Theory, which emphasize the importance of equal opportunities and access to technological resources for effective learning and institutional development. The paper adopts a conceptual and analytical approach, drawing evidence from existing literature, policy documents, and contemporary digital education initiatives. Findings reveal that inadequate digital infrastructure, high internet costs, limited institutional funding, unequal distribution of technological resources, and insufficient digital competencies among staff and students remain major barriers to equitable digital access in higher education institutions. These challenges disproportionately affect students from rural and socioeconomically disadvantaged backgrounds, thereby limiting educational participation, academic achievement, and workforce preparedness. The paper argues that educational managers play a critical role in bridging the digital divide through strategic leadership, inclusive policy formulation, capacity building, resource mobilization, and the promotion of technology-driven learning environments. Furthermore, equitable access to emerging technologies has the potential to enhance educational quality, foster innovation, improve graduate employability, and contribute significantly to sustainable human capital development. The study concludes that a coordinated effort among educational institutions, government agencies, and private-sector stakeholders is essential for creating an inclusive digital ecosystem capable of supporting equitable educational opportunities and national development in the digital age.

66. Digital Innovation and Family Well-Being: Understanding the Role of Digital and AI Tools Utilisation in the Increasing Cases of Marital Breakdown in the AI Era

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Digital innovation and artificial intelligence (AI) have reshaped marital communication, intimacy, privacy, and conflict management. However, the inappropriate use of digital and AI-enabled tools may contribute to relational insecurity, mistrust, and marital breakdown. This study investigates the relationship between digital and AI tool utilisation and increasing cases of marital breakdown in the AI era, with particular attention to digital communication platforms, tracking, deepfakes, and social media applications. Guided by the Technology Acceptance Model (TAM), social exchange theory, and the relational turbulence framework, the study adopts a mixed-methods explanatory sequential design. Quantitative data will be collected through structured questionnaires administered to married individuals and couples, measuring digital communication patterns, technoference, electronic partner surveillance, social media use, perceived privacy violations, relationship satisfaction, trust, conflict frequency, and marital instability. Qualitative data will be obtained through semi-structured interviews and focus group discussions with married couples, marriage counsellors, family therapists, and digital wellbeing practitioners. Thematic analysis will be used to interpret qualitative responses, while descriptive statistics, correlation analysis, and multiple regression or structural equation modelling will examine the direct and mediating effects of digital misuse on marital breakdown. The study conceptualises technoference as technology-induced interruption of couple interaction, which may reduce relationship satisfaction and increase conflict. It further examines how unauthorised phone tracking, excessive social media monitoring, online infidelity, and AI-generated deepfakes may intensify jealousy, suspicion, emotional distress, and coercive control. Findings are expected to inform family-life education, marital counselling, digital literacy programmes, and ethical guidelines for responsible AI use. The study recommends consent-based digital boundaries, transparent communication, digital privacy protection, and couple-based interventions to mitigate technology-related marital conflict and strengthen family wellbeing.

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Keywords: *digital innovation; artificial intelligence (AI); marital breakdown; technoference; digital communication*

67. Digital Innovations, and Teaching and Learning Effectiveness in Counselling Education at the Federal College of Education, Ilawe-Ekiti, Ekiti State, Nigeria

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Digital technologies have become increasingly important in teacher education, including Counselling Education, by providing new opportunities for delivering instructional content, facilitating lecturer–student interaction, strengthening access to learning resources, and supporting the development of technology-related competencies among prospective counsellors. This study examined the availability and utilisation of digital innovations and their reported effectiveness for teaching and learning at the Federal College of Education, Ilawe Ekiti, Ekiti State, Nigeria, with particular relevance to Counselling Education. A descriptive survey design was adopted. The study population comprised academic staff and NCE students of the College. Using simple random sampling across the five schools, 200 respondents were selected, consisting of 50 lecturers and 150 students. Data were collected using a researcher developed questionnaire titled Impact of Digital Innovation on Teaching and Learning Effectiveness Questionnaire (IDITALEQ). The instrument was subjected to expert review to establish content validity, while its internal consistency was established using Cronbach's alpha, which yielded a reliability coefficient of 0.82. Frequencies, percentages, means, and standard deviations were used to answer the research questions. One-sample t-tests were conducted at the 0.05 level of significance to determine whether the mean teaching- and learning-effectiveness scores differed from the neutral midpoint of 3.00 on the five-point scale. The findings indicated that learning management systems, virtual classroom platforms, interactive whiteboards, mobile learning applications, and e-library facilities were available, although respondents reported limitations in their provision. The utilisation of digital innovations was moderate. Lecturers recorded a mean teaching-effectiveness score of 3.84 (SD = 0.46), which was significantly higher than the neutral midpoint, $t(49) = 5.21$, $p < .001$. Similarly, students recorded a mean learning-effectiveness score of 3.76 (SD = 0.51), which was significantly higher than the neutral midpoint, $t(149) = 6.18$, $p < .001$. These findings indicate that reported teaching and learning effectiveness was above the scale midpoint. However, given the descriptive survey design and the use of one-sample t-tests, the findings do not establish a causal effect of digital innovation on teaching or learning effectiveness. The study therefore highlights the importance of sustained institutional support for technology enabled teacher and Counselling Education, particularly through improved digital infrastructure, reliable internet connectivity and power supply, continuous professional development in digital pedagogy and counselling-related technologies, and purposeful integration of appropriate digital tools into NCE programmes. It recommends that College management strengthen these areas and regularly evaluate the availability, utilisation, and educational value of digital technologies to enhance the preparation of competent, technology responsive prospective counsellors.

Keywords: *Digital Innovation, Teaching Effectiveness, Learning Effectiveness, Digital Technologies, Counselling Education, Teacher Education, Colleges of Education, Nigeria.*

68. Digital Learning Initiatives as Tools for Environmental Awareness and Sustainable Resource Management in Northern Nigeria

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This study explores the role of digital learning initiatives in promoting environmental awareness and sustainable resource management in Northern Nigeria. With increasing environmental challenges such as desertification, deforestation, climate change, and water scarcity, digital platforms offer innovative avenues for environmental education and public engagement. The research examines how digital learning tools, including e-learning platforms, mobile applications, and social media, enhance environmental knowledge, influence attitudes, and encourage sustainable resource-use practices among learners and communities. It also investigates challenges affecting their effectiveness, such as limited internet access, inadequate infrastructure, and low digital literacy levels. The study aims to provide insights into the potential of digital technologies to strengthen environmental education and support sustainable development efforts in Northern Nigeria. Findings are expected to inform policymakers and educators on strategies for integrating digital learning into environmental awareness and resource management programs.

69. DIGITALEntrepreneurship Education and University–Industry Synergy: Reimagining Future-ready Higher Education Ecosystems in Africa

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The rapid digitalization of economies is reshaping what African higher education institutions are expected to teach, how they engage with industry, and how knowledge is converted into social and economic value. At the same time, many African universities continue to face graduate unemployment, skills mismatch, weak research commercialization, limited industry engagement, and unequal access to digital infrastructure. This paper examines digital entrepreneurship education as a strategic mechanism for strengthening university–industry synergy and building future-ready higher education ecosystems in Africa, with particular attention to Nigeria. This paper is based on a qualitative conceptual and desk-review methodology, grounded in literature on entrepreneurship education, university-industry relations, digital transformation, innovation ecosystems, employability and African higher education policy. The analysis is based on the Triple Helix model of university-industry-government relations. It argues that entrepreneurship education needs to move away from conventional classroom-based business courses to digitally-enabled experiential and industry-linked education. Digital entrepreneurship curricula, innovation hubs, technology-enabled incubation, industry mentorship, internships, digital research platforms, intellectual-property support, and research-to-market pathways can connect university learning more closely with contemporary economic realities. The paper further identifies digital inequality, inadequate infrastructure, weak policy implementation, limited financing, low institutional readiness, insufficient industry participation, and gaps in staff and student digital competencies as major constraints. It proposes an ecosystem approach in which universities, industry, government, technology organizations and development partners jointly design curricula, finance innovation infrastructure, support digital ventures, and facilitate knowledge transfer. The paper concludes that digital entrepreneurship education can contribute to a more inclusive and future-ready African higher education system when it is embedded within broader institutional, industry and policy reforms rather than treated as an isolated course.

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Keywords: *Digital Entrepreneurship Education; University–Industry Synergy; Digital Innovation; Higher Education; Innovation Ecosystems; Digital Divide; Employability; Nigeria; Africa; Research Commercialization.*

70. Digitalizing Islamic Education in Northern Nigeria: Integrating Tsangaya, Higher Education, Educational Technology and Artificial Intelligence for a Future Learning Ecosystem

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Islamic education in Northern Nigeria occupies a distinctive position within the country's educational field, combining longstanding traditions of Qur'anic learning with contemporary Islamiyyah schools, colleges, universities and programmes in Islamic Studies. Among its most enduring institutions is the Tsangaya system, which has historically served as a major mechanism for Qur'anic memorization, Arabic learning, moral formation and transmission of Islamic knowledge. Yet the system exists within an increasingly digital educational environment characterized by artificial intelligence, mobile learning, digital libraries, online platforms, automated translation and generative AI. This creates both opportunities and risks. This article examines the prospects, challenges and policy pathways for digitally transforming Islamic education in Northern Nigeria using a qualitative, conceptual and documentary research design. It synthesizes scholarly literature, Nigerian education policies, African Union and UNESCO frameworks, studies on Tsangaya and Almajiri education, and recent scholarship on educational technology and artificial intelligence. The article argues that digital transformation should not be reduced to introducing computers, connectivity, online platforms, or AI applications. It should be conceived as the development of an inclusive, ethically governed, context-sensitive digital Islamic education ecosystem connecting traditional Tsangaya institutions with contemporary Islamic higher education. The analysis identifies potential applications of educational technology and AI in Qur'anic learning, Arabic instruction, teacher development, digital libraries, research, translation, personalized learning and assessment. It simultaneously identifies infrastructural, socioeconomic, linguistic, pedagogical, epistemological and ethical constraints. It pays particular attention to AI hallucinations, fabricated religious references, mistranslation, decontextualization, and the possibility of weakening established scholarly authority. To address these challenges, the

article proposes the Northern Nigeria Digital Islamic Education Framework (NN-DIEF), comprising six interconnected pillars: digital infrastructure; digital Islamic content; AI and educational innovation; human capacity; Islamic ethical and scholarly governance; and inclusion and sustainability. The article concludes that future-ready Islamic education in Northern Nigeria requires technological innovation anchored in human mentorship, scholarly verification, cultural sensitivity and digital inclusion. The experience delivers broader lessons for African education systems working to integrate emerging technologies while preserving indigenous knowledge traditions and ethical identities.

Keywords: *Islamic education; Tsangaya; Northern Nigeria; artificial intelligence; educational technology; digital divide; Islamic epistemology*

71. Education in Nigeria for Global Relevance: Artificial Intelligence (AI) - a Cause or a Blessing in the School System

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Nigeria, Africa's most populous nation, grapples with profound educational challenges: over 18 million out-of-school children, high learning poverty (with many unable to read proficiently after primary level education), chronic underfunding (far below UNESCO's 26% benchmark), overcrowded classrooms, teacher shortages, and stark urban-rural divides. Amid these, Artificial Intelligence (AI) holds promises for scaling quality education, personalizing learning, and building 21st-Century skills, essential for global competitiveness in the Fourth Industrial Revolution. Nigeria's National Artificial Intelligence Strategy (NAIS, 2024-2025), the National Digital Learning Policy, and initiatives like the free Artificial Intelligence Academy (launched 2025) signal strong governmental intents. This article examines AI's dual role in Nigerian Schools – as a blessing (enabling adaptive platforms, teacher efficiency, and inclusive access) and a cause for concern (widening digital divides, ethical risks, and infrastructural barriers). Drawing on recent reports (e.g., NAIS 2025, UNESCO validations, World Bank Pilots, and 2025-2026 studies), it argues that Artificial Intelligence can propel Nigeria toward global relevance only through targeted, equitable implementation, focused on infrastructure, teacher training, local content, and ethical governance. Without these, Artificial Intelligence risks becoming another vector of dependency and inequity.

72. Emerging Techniques and Future Learning

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Learning is a lifelong process that continues throughout an individual's life and remains fundamental to personal, social, and national development. The effectiveness of learning is significantly enhanced when supported with appropriate instructional resources, including visual, auditory, digital, and interactive teaching aids. As educational systems continue to evolve in response to rapid technological advancement, the integration of emerging technologies into teaching and learning has become increasingly indispensable. This paper examines emerging techniques and innovative technologies that are shaping the future of learning, with particular emphasis on the integration of Artificial Intelligence (AI), digital instructional tools, virtual learning environments, multimedia resources, and other educational technologies. The paper argues that regardless of individual preferences or institutional readiness, technology has become a central component of contemporary education and will continue to redefine classroom practices in the years ahead. The opportunities offered by Artificial Intelligence and other emerging technologies are vast, ranging from personalized learning experiences and intelligent tutoring systems to automated assessment, adaptive instruction, and enhanced learner engagement. The paper further emphasizes that teachers, whether professionally trained or untrained, must embrace technology-driven instructional practices and should not enter the classroom without appropriate teaching aids that facilitate effective knowledge delivery. Research has consistently shown that learners retain information more effectively when they actively engage with visual, practical, and interactive learning experiences than when they rely solely on verbal explanations. Consequently, the effective deployment of educational technologies has the potential to improve learners' motivation, critical thinking, creativity, collaboration, and overall academic performance. The paper concludes that the field of Educational Technology possesses enormous untapped potential capable of transforming teaching and learning across all levels of education. It recommends increased investment in digital infrastructure, continuous professional development for teachers, curriculum innovation, and institutional support for the integration of emerging technologies to prepare learners for the demands of the twenty-first-century knowledge economy.

Keywords: *Emerging techniques; Educational technology; Artificial intelligence; Digital*

73. Emerging Technologies and Future Learning: Preparing Future Teachers for Technology-Enhanced Storytelling: The Case of Storybird

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The rapid advancement of digital technologies has transformed teaching and learning processes, requiring future teachers to develop competencies in the integration of educational technologies into classroom instruction. Digital storytelling has emerged as an innovative pedagogical approach that promotes creativity, communication, critical thinking, and learner engagement. This paper examines the role of Storybird, a web-based digital storytelling platform, in preparing future teachers for technology-enhanced instruction. Specifically, the study explores how pre-service teachers utilize Storybird to design, create, and share digital stories that support teaching and learning across various subject areas. The paper highlights the pedagogical benefits of Storybird, including the enhancement of digital literacy skills, creative expression, collaboration, and instructional design competencies. Furthermore, it discusses the opportunities and challenges associated with integrating Storybird into teacher education programmes, such as access to technology, digital competence, and institutional support. Drawing on contemporary literature and emerging trends in educational technology, the study argues that the incorporation of digital storytelling tools such as Storybird into teacher preparation programmes can equip future educators with the knowledge and skills required to create engaging, learner-centred, and technology-rich learning environments. The paper concludes that technology-enhanced storytelling represents a valuable strategy for preparing future-ready teachers capable of meeting the demands of 21st-century education and fostering meaningful learning experiences in increasingly digital classrooms.

74. Emerging Technologies in Science Education and the fundamental issues in shaping the future

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The integration of emerging technologies into education is rapidly gaining momentum worldwide. In science education, these technologies play a significant role in enhancing teaching, learning, practical activities, and assessment processes. A wide range of digital tools are now available to support science instruction and improve learners' engagement and understanding. Some of these technologies are highlighted in this paper. Despite their numerous benefits, the adoption of emerging technologies in science education presents several fundamental challenges, including issues related to accessibility, infrastructure, teacher preparedness, equity, and sustainability. This paper examines these challenges and discusses their implications for shaping the future of science education. It further explores strategies for ensuring the sustainable use of emerging technologies in educational settings. The paper recommends that teacher educators, students, educational institutions, policymakers, and other stakeholders collaborate to address these challenges effectively. In addition, governments at all levels should ensure the availability of technological resources and promote equitable access to support effective science teaching and learning for a sustainable future.

75. Enhancing future-Ready through Artificial Intelligence and Emerging Technologies in Africa Higher education: A study of Colleges of Education in North- West, Nigeria

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The rapid advancement of Artificial Intelligence (AI) and emerging technologies is transforming the landscape of higher education globally, creating new opportunities for innovative teaching, personalised learning, and enhanced institutional effectiveness. In Africa, however, the adoption and integration of these technologies remain uneven due to challenges related to infrastructure, digital literacy, policy implementation, and resource availability. Colleges of Education, as key institutions responsible for preparing future teachers, must adapt to these technological developments to produce graduates equipped with twenty-first-century competencies and capable of supporting future-ready learning environments.This study investigates the role of Artificial Intelligence and emerging technologies in enhancing future-ready learning within Colleges of Education in North-West Nigeria. Specifically, the study examines the level of awareness and utilisation of AI-driven tools and emerging technologies, identifies the

competencies required by lecturers and students, explores the opportunities associated with technology-enhanced learning, and analyses the challenges hindering effective integration. The study is anchored on the Technology Acceptance Model (TAM) and the Diffusion of Innovation Theory, which provide a framework for understanding technology adoption and utilisation in educational settings.A descriptive survey research design will be employed involving lecturers, administrators, and students drawn from selected Colleges of Education in North-West Nigeria. Data will be collected using a structured questionnaire and analysed using descriptive and inferential statistics. The study is expected to reveal significant potential for AI-powered educational tools, virtual learning environments, learning analytics, adaptive learning systems, and other emerging technologies to improve teaching effectiveness, learner engagement, digital skills acquisition, and institutional innovation. However, findings are also anticipated to highlight persistent barriers, including inadequate digital infrastructure, insufficient professional development opportunities, limited funding, and policy implementation gaps.The study proposes strategic measures for strengthening digital capacity, enhancing AI competencies among educators, promoting technology-enabled pedagogies, and fostering institutional readiness for future learning. The findings will contribute to the growing discourse on digital transformation in African higher education and provide evidence-based recommendations for policymakers, educational leaders, and development partners seeking to bridge the digital divide and build resilient, inclusive, and future-ready higher education systems.Keywords: Artificial Intelligence, Emerging Technologies, Future-Ready Learning, Higher Education, Colleges of Education, Digital Transformation, North-West Nigeria, Africa.

76. Entry qualifications as predictors of first year NCE CGPA among students of Federal College of Education Technical BICHI Kano State: The need to integrate Artificial intelligence in Higher...

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The study determined whether SSCE and UTME scores were predictors of first year NCE CGPA Academic Achievement of 2020/2021, 2021/2022 and 2022/2023 sessions Among students of Federal College of Education (Technical) Bichi, Kano State. The study was guided by three objectives and three hypotheses that were all tested at 0.05 level of significance. The study employed correlational research design. The population of the study was one thousand seven hundred and eighty- seven (1787), one thousand eight hundred and fifty- one (1851) and one thousand nine hundred and ninety-six (1996) for the 2020/2021, 2021/2022 and 2022/2023 respectively. Similarly, the sample size of the study was three hundred and sixty- three (363), three hundred and sixty-one (361) and three hundred and thirty (330) for the 2020/2021, 2021/2022 and 2022/2023 respectively. The sampling technique used in selecting the subjects was cluster and simple random sampling techniques. Row SSCE and UTME scores for 2019,2020 and 2021 sessions were collected and correlated with First year NCE CGPA for three sessions visa viz 2020/2021,2021/2022 and 2022/2023. The data were all analyzed using multiple regression analysis. The results showed that 2019/2020 SSCE and UTME scores does not predict the first year CGPA students' scores in 2020/2021. Similarly, the SSCE and UTME scores in 2020/2021 session (as an entry qualification) does not predict the 2021/2022 first year NCE CGPA students' academic achievement of students of Federal College of Education (Technical) Bichi. Finally, the SSCE and UTME scores in 2021/2022 session, does not predict the first year NCE CGPA students' academic achievement in 2022/2023 session. The study concluded that, SSCE and UTME scores do not in any way assist students' to perform better first year NCE CGPA academic achievement in 2020/2021, 2021/2022 and 2022/2023 respectively. The study recommended that, here should be post UTME examinations before students are admitted to study NCE program and that additional credits should added for the SSCE pre-qualification requirements aside the normal four credits that was considered before candidates were admitted to study NCE program.

77. Ethical Artificial Intelligence Utilisation for Impact-Driven Academic Research Writing and Research Innovation among Industrial Technology Education Postgraduate Students in South-East...

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The development of Artificial Intelligence (AI) is significantly impacting academic research globally. This study investigated the ethical utilisation of artificial intelligence for impact-driven academic research writing and research innovation among Industrial Technology Education (ITE) postgraduate students in South-East Nigeria. Five research

questions and five hypotheses guided the study. The study adopted a descriptive survey design. The population of the study consisted of 86 postgraduate students, comprising 69 male and 17 female postgraduate students in universities offering ITE in South East Nigeria. The entire population was used since the population was manageable in size. Data was collected using a 75-item structured questionnaire titled: AI in Research Questionnaire (AIRQ). The instrument was validated by two experts from the Department of ITE and one expert from Measurement and Evaluation unit in the Department of Science Education, all in Michael Okpara University of Agriculture, Umudike, Abia State. A reliability coefficient of .87 was obtained using the Cronbach's alpha formula. Mean was used to answer research questions, while t-test was used to test the null hypotheses at .05 level of significance. The study revealed that the extent of utilisation of AI tools for research among postgraduate students in universities in South East Nigeria is generally low. This study recommends among others that universities should organise structured AI literacy trainings for ITE postgraduate students; implement supportive university policies; encourage inter-university collaboration; and establish AI Ethics Evaluation Committees. The study concluded that ethical AI utilisation can strengthen research efficiency, writing quality, creativity, critical thinking and innovation, and also ensure knowledge creation and future-ready higher education systems capable of addressing societal and economic challenges in Africa.

Keywords: *Artificial Intelligence, Research Writing, Research Innovation, Nigeria, Postgraduate Students, Industrial Technology Education*

78. Ethical Challenges in the Integration of Artificial Intelligence into Special Education

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The impact of artificial intelligence (AI) on education in general and special education in particular is a topic of significant importance as AI continues to change numerous sectors. The integration of AI technology in special education has introduced numerous possibilities and benefits. However, it also raises ethical concerns that demand careful consideration. This research work explores the ethical implications associated with the implementation of AI in special education. Prominent among the ethical challenges considered in this paper include privacy and data security, bias and fairness, transparency and explainability, accountability and responsibility, as well as social and environmental impact, as they relate to and affect special education. Drawing on the works of notable special education researcher, it examines the moral considerations inherent in the use of artificial intelligence technologies in special educational settings. This review analyses the challenges and ethical ramifications of AI in special education and suggests strategies for responsible implementation. The importance of this study is underscored by its focus on balancing the integration of AI into special education, emphasising the indispensability of human educators, and then offers perspectives on ensuring fairness, transparency, and inclusivity in AI-enhanced special education. Addressing these ethical issues is vital for upholding academic integrity, promoting equitable access, and maintaining human engagement in educational settings in general and in special education in particular.

79. Evaluation of Artificial Intelligence (AI) Use in Environmental Management Programmes in Selected Nigerian Higher Institutions

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This study assessed the awareness, availability, integration, and application of Artificial Intelligence (AI), as well as challenges affecting its adoption among Environmental Management students in selected Nigerian universities. A cross-sectional survey design was adopted, involving 220 undergraduate and postgraduate students from five universities in southeastern Nigeria. Data were collected using structured questionnaires and analysed using descriptive statistics, Spearman's rank-order correlation, and Principal Component Analysis (PCA). The findings revealed moderate general awareness of AI, but limited knowledge of its specialised environmental applications. GIS-based technologies recorded the highest level of availability and use, while machine learning platforms, generative AI tools and environmental monitoring technologies recorded relatively low adoption. AI application was more prominent in environmental modelling, decision-making and student assessment, but limited in teaching, fieldwork, data analysis and curriculum delivery. Significant positive relationships were observed among the AI tools examined ($\rho = 0.631–0.945$, $p < 0.001$). Major adoption challenges included inadequate maintenance and technical support, poor internet connectivity, shortage of AI experts, high costs, and inadequate infrastructure. PCA identified two broad dimensions of adoption challenges, relating to infrastructural/technical accessibility and institutional, educational/behavioural constraints. The study concludes that despite growing AI awareness, its practical integration

into Environmental Management programmes remains limited. Improved infrastructure, capacity development, curriculum integration, and institutional support are therefore necessary to enhance AI adoption.

Keywords: *Artificial intelligence, AI adoption, Environmental Management, university students, Nigeria.*

80. Exploring Artificial Intelligence in the Teaching of Languages in Higher Education

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The fast development of Artificial Intelligence (AI) has brought about transformational practices in education across disciplines, including language education in higher institutions. AI-powered technologies such as intelligent tutoring systems, machine translation tools, speech recognition applications, chatbots and adaptive learning platforms are increasingly being added into language teaching and learning. This paper explores the role of AI in enhancing language instruction in higher education, examining its potential to improve learner engagement personalized learning, language proficiency development and assessment practices. Reviewing recent literature and emerging educational trends, the study discusses how AI supports both teachers and students by facilitating individualized feedback, autonomous learning and access to authentic linguistic resources. The paper also highlights challenges associated with AI adoption, including ethical concerns, data privacy issues, digital inequality and the need for adequate teacher training. Findings suggest that while AI cannot replace the pedagogical expertise of language educators, it serves as a valuable complement that enhances teaching effectiveness and learning outcomes. The study concludes that successful integration of AI in higher education language classrooms requires institutional support, digital literacy development and the establishment of ethical guidelines for AI use. The paper contributes to ongoing discussions on the future of technology-enhanced language education and provides recommendations for educators, policymakers, and researchers seeking to leverage AI for sustainable language teaching and learning.

81. Exploring the Emerging Technologies in African Higher Education: Utilizing Artificial Intelligence in Future Learning in Nigerian Higher Institutions

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Artificial Intelligence (AI), as an emerging technological asset in today's world, is making undeniable waves in various endeavours of life. The impacts of AI has prompted the researcher to engage in this research set to establish the nexus between artificial intelligence and future learning in Africa using Nigerian higher institutions as the study. The work is hinged on the theory called Connectivism. The work employed survey method in generating data; and the statistical tool used is the Correlation Coefficient. The findings showed that there is strong positive relationship between artificial intelligence (AI) and future learning in African higher education. Consequently, recommendations are made that governmental and non governmental agencies should prioritize introducing and funding the use of AI in teaching and learning in African higher education. The imperativeness of utilizing AI in education sector reshapes future learning in African Education (Nigeria).

82. Exploring the Use of Chatgpt in English Language Learning: Perceptions and Experiences of College of Education Students in Africa

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The emergence of generative artificial intelligence technologies has significantly transformed the landscape of teaching and learning across the globe. Among these innovations, ChatGPT has gained prominence as an interactive language-based tool capable of supporting writing, reading, research, communication, and independent learning. In teacher education institutions across Africa, where efforts are being made to prepare future educators for participation in a digitally driven knowledge economy, ChatGPT presents both new opportunities and complex challenges for English language learning. Despite its growing popularity among students, there remains limited empirical understanding of how prospective teachers perceive and utilize the technology within their academic environments. This paper investigates the perceptions and experiences of College of Education students regarding the use of ChatGPT in English language learning. Anchored on contemporary theories of technology acceptance and AI-assisted learning, the study explores students' awareness, patterns of use, perceived benefits, and concerns

associated with the application of ChatGPT in language-related tasks. Particular attention is given to its role in enhancing writing skills, vocabulary development, grammar accuracy, reading comprehension, lesson preparation, academic research, and self-directed learning. The paper argues that ChatGPT offers considerable potential for improving access to personalized learning support, fostering learner autonomy, and strengthening digital engagement among future teachers. By providing immediate feedback and facilitating interactive learning experiences, the technology can contribute to the development of both linguistic competence and digital literacy—two essential skills for educators in the twenty-first century. However, the study also identifies critical concerns relating to academic dishonesty, overdependence on artificial intelligence, misinformation, data privacy, and the possible erosion of critical thinking and creative language production. The paper advocates for a balanced and ethically guided integration of ChatGPT into teacher education programmes. It recommends the development of institutional policies, AI literacy initiatives, and pedagogical frameworks that encourage responsible use while preserving academic integrity and authentic learning. The study concludes that the effective incorporation of ChatGPT into English language education can serve as a catalyst for bridging the digital divide and preparing future teachers to function effectively within emerging digital learning ecosystems across Africa.

83. Exploring Undergraduate Students Awareness, Usage and Perceptions of Generative AI for Academic Writing of Usmanu Danfodiyo University, Sokoto, Nigeria

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The emergence of Generative Artificial Intelligence (AI) tools has transformed academic writing practices among university students worldwide by providing proofreading, summarization, information retrieval etc. This study aimed to assess the level of awareness, extent of usage, and perceptions of Generative AI for academic writing among students of Usmanu Danfodiyo University, Sokoto (UDUS). A cross-sectional survey was employed involving 430 undergraduate students selected from four faculties. Respondents were drawn from different levels using a structured questionnaire. The findings revealed a high level of awareness among Faculty of Science students (94.2%), Management Sciences (89.8%), Law (84.5%), and Arts (79.6%). Awareness increased progressively across levels of study, from 69.4% among 100-level to 95.7% among 500-level students. Similarly, 74.6% reported using Generative AI for academic writing activities (78.2%), summarization (73.5%), idea generation (71.4%), literature searches (67.8%), and proofreading (63.9%). Students in the Faculty of Science recorded the highest usage (82.1%), Faculty of Arts reported the lowest usage rate (61.3%). However, 76.8% of respondents considered Generative AI are useful for improving writing, creativity and productivity. Perception varied across faculties, with Science students demonstrating the most perception (84.6%), Management Sciences (79.4%) and Law (74.8%), while Arts students recorded the lowest (62.7%). Major concerns identified were plagiarism (68.4%), misinformation (60.2%), academic dishonesty (58.1%), and overdependence on AI technologies (55.9%). In conclusion Generative AI has gained substantial acceptance among undergraduate students of UDUS. The study recommends the need for targeted AI literacy programmes, institutional guidelines and ethical considerations to promote responsible use of Generative AI in higher education.

Keywords: *Academic, Awareness, Artificial Intelligence, Generative, Higher Education, Sokoto*

84. Financing the Digital Transformation of Higher Education in Africa: Pathways to Sustainable and Future-Ready Universities

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Africa's higher education is in a state of profound transformation. Increasingly, universities and other tertiary institutions are expected to provide quality education, promote research and innovation, embrace digital technologies and equip graduates for rapidly changing economies. Many institutions still operate under severe financial limitations, caused by insufficient public funding, rising operating costs, limited infrastructure and the constant increase in demand for digital services. These pressures raise an important question: how can African higher education institutions finance the digital transformation required to become sustainable and future-ready? This paper examines innovative financing as a pathway for supporting digital transformation and sustainable development in African higher education. It explores alternative approaches to institutional financing, including public–private partnerships,

endowment funds, alumni contributions, research commercialization, education bonds, digital funding platforms and industry-supported innovation initiatives. Particular attention is given to how these financing mechanisms can support digital infrastructure, technology-enabled teaching and learning, research and innovation, university–industry collaboration, and the development of entrepreneurial and technology-oriented learning environments. The paper adopts a qualitative desk-research approach, drawing on scholarly literature, policy documents, institutional reports and relevant African and international evidence. It states that the investment in technology alone is not enough to sustain the digital transformation. To meet their changing institutional and technological needs, universities need a diversified, transparent, accountable and responsive financing model. Innovative financing can open up new opportunities, but its success may be limited by weak regulations, low institutional financial capacity, limited private sector involvement, the digital divide and wider economic issues affecting African economies. The paper therefore advocates an integrated financing approach in which governments, universities, the private sector, development partners, alumni and other stakeholders contribute to the digital transformation of higher education. Strengthening financial governance, expanding university–industry partnerships, commercializing research outputs, developing digital financing mechanisms and creating supportive policy environments can help African higher education institutions build stronger research and innovation ecosystems. Such an approach can contribute to narrowing the digital divide and creating higher education systems that are more sustainable, inclusive, innovative and responsive to the demands of Africa's emerging knowledge economy.

85. Fraudulent URL Detection Using Multi-Tokenization, Dimensionality Reduction and Deep-learning methods

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This study presents a deep-learning framework for detecting fraudulent URLs through the systematic combination of URL tokenization, dimensionality reduction, class balancing and neural-network classification. Four tokenization strategies namely: character, word, subword and n-gram which were evaluated with four dimensionality-reduction approaches: Principal Component Analysis (PCA), Non-negative Matrix Factorization (NMF), Variational Autoencoder (VAE) and Autoencoder. Five deep-learning classifiers such as CNN-LSTM, CNN-GRU, LSTM-GRU, Transformer and Deep Neural Network (DNN), were subsequently evaluated. The experimental design therefore comprised 80 model configurations. An 80:20 stratified train-test split was used, and SMOTE was applied only to the training partition to address class imbalance without altering the independent test distribution. The supplied experimental results show that all 80 configurations completed successfully. The strongest individual configuration was n-gram tokenization combined with PCA and DNN classification, achieving 99.606% accuracy, 99.359% precision, 99.956% recall, 99.656% F1-score and 99.808% ROC-AUC. Its confusion matrix contained 20,015 true negatives, 174 false positives, 12 false negatives and 26,958 true positives. Across the full experiment set, subword tokenization had the highest mean ROC-AUC among tokenization families, VAE had the highest mean ROC-AUC among dimensionality-reduction methods and DNN had the highest mean ROC-AUC among classifiers. The findings indicate that URL representation and its interaction with dimensionality reduction and classifier architecture are critical to detection performance. The study also provides an automatically reproducible evaluation pipeline that stores model metrics, confusion matrices, ROC curves, training curves and deployment artifacts. The implemented system also provides a web-based interface for testing URL status such as fraudulent or legitimate.

Keywords: *fraudulent URL detection; phishing; tokenization; n-gram; subword; PCA; NMF; VAE; autoencoder; deep learning; DNN; cybersecurity*

86. From Black Boxes to Knowledge Commons: A Governing Framework for AI Memory Transparency, and Accountability

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Artificial intelligence (AI) systems are increasingly embedded in social, economic, and political processes, yet their governance remains largely centered on opaque, centralized "black-box" models. While existing research has focused primarily on algorithms and model outputs, less attention has been paid to AI memory, defined as the mechanisms through which systems store, retrieve, and reuse information over time. This paper argues that AI memory represents a critical but underexplored site of governance with significant implications for transparency, accountability, and power distribution. Drawing on AI governance and knowledge commons theory, the paper develops a

four-dimensional analytical framework (ownership, access, governance, and transparency) to compare centralized and commons-based governance paradigms. It examines how recent advances in modular AI architectures, particularly retrieval-augmented generation (RAG) and vector-based memory systems, enable the structural decoupling of memory from core models, thereby creating new institutional possibilities. Building on this analysis, the paper proposes a hybrid governance model in which AI models remain centrally managed while memory components are governed as a structured knowledge commons through layered institutional arrangements. The study contributes to ongoing debates on digital governance by reframing AI memory as governable infrastructure and demonstrating how modularity can support more inclusive, transparent, and accountable AI systems.

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Keywords: *AI governance, knowledge commons, modular AI memory, retrieval-augmented generation, black-box AI, participatory governance, digital infrastructure*

87. From Traditional Diplomacy to AI Governance: Reimagining the United Nations for Contemporary Global Challenges

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This study examined the transformation of global governance from traditional diplomacy to artificial intelligence (AI)-driven governance and explored the implications for reimagining the United Nations (UN) in addressing contemporary global challenges. The study was motivated by the rapid advancement of AI technologies, which had significantly altered international relations, decision-making processes, security dynamics, and global cooperation mechanisms. It investigated the limitations of conventional diplomatic approaches in responding to emerging issues such as cyber threats, algorithmic governance, digital inequality, misinformation, and the ethical implications of AI deployment across nations. The study adopted global governance theory. The study adopted a qualitative and historical approach, relying on secondary data obtained from scholarly publications, policy documents, reports of international organizations, and official UN publications. Findings revealed that traditional diplomatic structures had struggled to keep pace with the speed, complexity, and transnational nature of AI-related challenges. The study further found that the UN's existing institutional framework required substantial reforms to effectively regulate AI technologies, promote digital inclusiveness, safeguard human rights, and facilitate international cooperation in the governance of emerging technologies. It was observed that AI governance demanded a more adaptive, collaborative, and multidisciplinary model of global governance than that provided by conventional state-centric diplomacy. The study concluded that the future relevance of the United Nations depended on its capacity to integrate AI governance into its core functions and establish robust mechanisms for global technological oversight. It recommended the creation of specialized AI governance bodies within the UN system, the development of international AI regulatory frameworks, and the strengthening of partnerships among states, private technology firms, civil society organizations, and research institutions to ensure responsible and equitable AI governance in the twenty-first century.

88. Future of Inclusive Higher Education in Africa:A Review of AI, Emerging Technologies, and Universal Design for Learning for Students with Disabilities

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The accelerating shift toward digital education in African higher learning institutions offers promising avenues for enhancing inclusive learning opportunities for students with disabilities. Yet, many universities still struggle with shortcomings such as underdeveloped digital infrastructure, learning platforms that are not accessible, a lack of assistive tools, inconsistent enforcement of inclusion policies, and inadequate training for educators in inclusive pedagogy. This review investigates the prospects for inclusive higher education in Africa by analyzing how Artificial Intelligence (AI), emerging educational technologies, and the Universal Design for Learning (UDL) framework can support access, engagement, and academic achievement for students with visual, hearing, physical, intellectual, and learning disabilities. Based on recent research, policy analyses, and international best practices, the paper outlines how AI-driven solutions, like speech-to-text conversion, real-time captioning, adaptive learning systems, intelligent tutoring, screen readers, and data-based predictive tools, are expanding accessibility. It also considers the impact of innovations such as virtual classrooms, mobile learning apps, augmented and virtual reality, and cloud-based accessibility services in promoting equitable participation. Additionally, UDL is presented as a vital approach for building adaptable educational environments that support varied learning preferences through diverse methods of

engagement, content delivery, and assessment. Nevertheless, despite their potential, widespread adoption is hindered by persistent challenges including unequal access to technology, insufficient funding, unreliable internet, limited institutional expertise, and weak implementation of accessibility standards. The review emphasizes that realizing inclusive higher education across Africa will depend on collaborative action among governments, academic institutions, tech developers, and disability rights stakeholders, along with long-term investment in fair and accessible digital education systems.

Keywords: *Inclusive higher education, Artificial Intelligence, Universal Design for Learning, emerging technologies, students with disabilities, digital accessibility, Africa.*

89. Generative Artificial Intelligence, Academic Integrity and the Transformation of English Language Education in African Higher Education

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The rapid integration of generative artificial intelligence (GenAI) into higher education is reshaping language learning, academic writing, assessment and knowledge production, while simultaneously raising concerns about academic integrity, authorship and the changing role of educators. This study examined the implications of GenAI for English language education in African higher education, focusing on pedagogical transformation, assessment integrity and lecturers' readiness for responsible AI integration. A descriptive survey design was adopted, involving lecturers in English Education departments in selected higher education institutions. Data were collected using a structured questionnaire measuring lecturers' perceptions of GenAI applications, pedagogical opportunities, assessment-related risks, ethical concerns, institutional preparedness and professional competencies required for responsible adoption. Data were analysed using descriptive statistics and inferential techniques at the 0.05 significance level. The study conceptualised responsible GenAI integration as a balance between technological innovation and the preservation of critical thinking, originality, human judgement and academic standards. Findings indicated that GenAI offered substantial opportunities for personalised language instruction, automated formative feedback, writing support, curriculum development and expanded access to learning resources. However, concerns regarding AI-assisted academic misconduct, inaccurate outputs, reduced learner autonomy, authorship ambiguity, data privacy and inadequate institutional policies presented significant challenges. The study argues that banning GenAI is unlikely to provide a sustainable response to its growing presence in education. Instead, higher education institutions should develop AI literacy frameworks, redesign assessment practices, establish clear academic-integrity policies and strengthen lecturers' professional capacity for responsible AI-supported pedagogy.

Keywords: *Generative Artificial Intelligence, academic integrity, English language education, higher education, AI literacy, assessment, Africa*

90. Generative Artificial Intelligence, Digital Literacy, and Academic Writing for Transforming English Language Education in African Higher Education

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The emergence of Generative Artificial Intelligence (GenAI) is transforming academic communication, digital literacy, and language learning across higher education. While these technologies present new opportunities for improving teaching, learning, and academic writing, many African higher education institutions continue to rely on conventional pedagogical approaches that inadequately prepare students to communicate effectively and ethically in digitally mediated academic environments. This study examines the role of Generative Artificial Intelligence and digital literacy in transforming English Language education for future-ready African higher education. The objectives were to: (i) examine the relevance of GenAI and digital literacy in English Language education; (ii) identify barriers to their responsible and effective integration into language teaching and learning; (iii) evaluate their potential to enhance academic writing, critical thinking, communication skills, and digital competence; and (iv) propose a pedagogical framework aligned with Education 5.0 and Smart Campus initiatives. The study adopts a qualitative review of contemporary literature, educational policies, and international best practices in AI-supported language education. Findings indicate that integrating AI-assisted writing tools, digital literacy strategies, and collaborative learning platforms significantly enhances students' writing proficiency, learner engagement, academic integrity awareness, and communication competence while supporting Sustainable Development Goals (SDGs), particularly SDG 4 and SDG 10. The study concludes that curriculum innovation, faculty digital upskilling, responsible AI use, and institutional policies

are essential for preparing graduates capable of communicating effectively in the rapidly evolving digital knowledge economy.

Keywords: *English Language Education, Generative Artificial Intelligence, Digital Literacy, Academic Writing, AI-Assisted Learning, Digital Pedagogy, Education 5.0, Smart Campuses, Higher Education, Sustainable Development Goals (SDGs).*

91. Generative Artificial Intelligence, Digital Twins, and Immersive Learning for Transforming Building Technology Education in African Higher Education

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The rapid emergence of Generative Artificial Intelligence (GenAI), Digital Twin technologies, and immersive learning environments is transforming the built environment industry and redefining the competencies required of Building Technology graduates. Despite these advances, many African higher education institutions continue to adopt traditional instructional approaches that provide limited exposure to intelligent design, smart building systems, and digital innovation. This study examines the role of Generative AI, Digital Twins, and immersive learning technologies in transforming Building Technology education for future-ready African higher education. The objectives were to: (i) examine the relevance of these emerging technologies in Building Technology education; (ii) identify barriers to their effective integration into higher education curricula; (iii) evaluate their potential to enhance students' creativity, digital design competence, critical thinking, collaboration, and problem-solving skills; and (iv) propose a curriculum transformation framework aligned with Education 5.0 and Smart Campus initiatives. The study adopts a qualitative review of contemporary literature, policy documents, and international best practices in digital built environment education. Findings indicate that integrating GenAI-driven design tools, Digital Twins, Virtual Reality (VR), and Augmented Reality (AR) into teaching significantly enhances experiential learning, innovation, interdisciplinary collaboration, and graduate employability while advancing Sustainable Development Goals (SDGs), particularly SDG 4 and SDG 9. The study concludes that curriculum innovation, digital infrastructure investment, faculty capacity development, and stronger university–industry collaboration are essential for preparing graduates capable of leading Africa's smart built environment and digital transformation agenda.

Keywords: *Generative Artificial Intelligence, Digital Twins, Building Technology Education, Smart Buildings, Virtual Reality, Augmented Reality, Immersive Learning, Education 5.0, Smart Campuses, Sustainable Development Goals (SDGs).*

92. Harnessing Artificial Intelligence and Digital Technologies for Sustainable Aquaculture in Africa: Opportunities for Fish Genetic Improvement, Selective Breeding and Smart Hatchery...

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Aquaculture has an increasingly important role in addressing Africa's growing demand for aquatic foods, improving livelihoods, generating employment and strengthening food and nutrition security. Despite the continent's considerable aquatic resources and favourable conditions for fish farming, aquaculture productivity remains constrained by inadequate access to quality fish seed, weak genetic improvement programmes, inconsistent broodstock management, inefficient hatchery operations, high production costs and limited adoption of modern technologies. These challenges highlight the need for a strategic transition from conventional fish production systems towards knowledge-driven, genetically improved and digitally enabled aquaculture. This paper examines how Artificial Intelligence (AI), the Internet of Things (IoT), genomic technologies and digital decision-support systems can transform sustainable aquaculture development across Africa, using Nigeria as a major case study. It adopts a conceptual research approach based on an integrative review and synthesis of relevant scientific literature, institutional publications and technological developments. The paper examines the applications of AI in fish growth prediction, feeding optimisation, biomass estimation and health surveillance; IoT in real-time water-quality monitoring, environmental control and smart hatchery management; and genomic technologies in broodstock characterisation, genetic diversity assessment, pedigree management and selective breeding. Particular attention is given to African catfish (Clarias gariepinus) and Nile tilapia (Oreochromis niloticus), two important freshwater aquaculture species in Africa. The paper further examines the role of African universities in developing digital competencies, strengthening aquaculture research infrastructure, promoting interdisciplinary collaboration and facilitating technology transfer to fish farmers and hatchery operators. An African Digital Aquaculture Innovation and

Genetic Improvement Framework (ADAIGIF) is proposed to connect digital infrastructure, AI-driven production management, genetic improvement, smart hatcheries, higher education, industry partnerships and supportive policies. The framework is designed to be scalable, affordable and adaptable to different African aquaculture production systems. The paper argues that the future of African aquaculture will not depend solely on increasing the number of fish farms, but on producing genetically superior fish, improving seed quality, adopting intelligent hatchery systems and empowering universities to drive digital innovation. It concludes that coordinated investment in genetic improvement, digital infrastructure, research capacity and technology transfer offers a practical pathway towards more productive, resilient and sustainable aquaculture across Africa.

Keywords: *African aquaculture, artificial intelligence, digital innovation, Internet of Things, fish genetics, genomic selection, selective breeding, smart hatchery management, higher education, Nigeria.*

93. Human-Centred Generative Artificial Intelligence for Transforming Teaching, Learning, and Research in African Higher Education

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The rapid advancement of Generative Artificial Intelligence (GenAI) is transforming teaching, learning, research, and institutional management across higher education worldwide. However, its adoption in many African higher education institutions remains constrained by inadequate digital infrastructure, limited AI literacy, ethical concerns, and weak governance frameworks. This study examines the role of human-centred Generative Artificial Intelligence in transforming teaching, learning, and research for future-ready African higher education ecosystems. The objectives were to: (i) examine the relevance of human-centred GenAI in enhancing teaching, learning, and research; (ii) identify barriers to its responsible and ethical adoption in higher education; (iii) evaluate its potential to improve intelligent learning systems, personalized education, academic productivity, and institutional innovation; and (iv) propose a governance framework for integrating GenAI in alignment with Education 5.0 and Smart Campus initiatives. The study adopts a qualitative review of contemporary literature, policy documents, and international best practices in AI-enabled education. Findings indicate that responsible deployment of GenAI enhances digital pedagogy, research collaboration, student engagement, and institutional efficiency while advancing Sustainable Development Goals (SDGs), particularly SDG 4 and SDG 9. The study concludes that AI governance, curriculum innovation, faculty capacity development, digital infrastructure investment, and institutional AI policies are critical to building resilient, inclusive, and future-ready higher education ecosystems across Africa.

Keywords: *Human-Centred Artificial Intelligence, Generative Artificial Intelligence, AI Governance, Intelligent Learning Systems, Digital Pedagogy, Education 5.0, Smart Campuses, Higher Education, Sustainable Development Goals (SDGs).*

94. Impact of Artificial Intelligence in the Teaching and Learning Social Studies Education in Junior Secondary Schools in Katsina State, Nigeria

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This study investigated the impact of artificial intelligence in the teaching and learning of Social Studies education in junior secondary Schools in Katsina State, Nigeria. Two objectives and two corresponding research questions guided the study. The study employed a descriptive survey research design. The population of the study comprised of all the 55 social studies teachers of seven (7) public junior secondary schools in Jibia LGA. A purposive sampling technique was used to select 35 Social Studies teachers from four (4) urban public junior secondary schools. Data for the main study was collected using a Poripo (2025) adapted 30 items structured questionnaire entitled: Benefits and Challenges of Artificial Intelligence (BACAI) in Teaching and Learning Social Studies was adapted and used as data collection instrument. The instrument was validated by three experts from education department of Yusuf Bala College of General Studies, Daura, in terms of face, content and construct validities in which a reliability coefficient of 0.84 was established, indicated that the instrument was reliable. The data gathered were analyzed using mean and standard deviation, any items with the mean rating of 2.50 and above were regarded as accepted, while any item with the mean ratings less than 2.50 were rejected. The results from the study revealed that Artificial Intelligence (AI) is beneficial to junior secondary school's students. Also, the study revealed that there were challenges associated with the integration of AI in junior secondary schools in Katsina State. Therefore, the researcher concluded that Artificial Intelligence (AI) is of grate befitting to both teachers and students especial in teaching and learning of social studies at junior secondary schools. Based on the findings from the study, it was recommended among others that free teachers capacity building

on AI learning resources, procurement and distribution of smart/tablet phones to teachers, personal computers, installment of solar power generation and internets services should be adequately provided for schools, to bridge the gap and improve teaching and learning in junior secondary schools.

95. Impact of Artificial Intelligence Use on Students' Effective Learning in Kwara State Colleges of Education, Nigeria

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This study examined the impact of artificial intelligence (AI) use on students' effective learning in Kwara State Colleges of Education (COEs), Nigeria. It adopted descriptive research design of survey type. The population of the study comprised all the 4,500 students in the three Colleges of Education owned by the Kwara State government. Proportionate sampling technique was used to select 354 students, using Krejcie and Morgan table (1970) for sample size determination. Impact of Artificial Intelligence Use on Students' Effective Learning Questionnaire (IAIUSELQ) was used to collect data for the study. The instrument was validated and its reliability test via the use of Cronbach's Alpha produced a reliability index of 0.85. Mean, Percentage, and t-test were used to analyse the data. The findings of the study revealed that AI provides students with ample access to online materials to support their learning, helps students to correct grammatical blunders, assists students to lay hands on unlimited materials for their projects, helps students to solve Mathematical problems, and enables students to acquire skills on how to paraphrase borrowed ideas. The study concluded that AI helps in enhancing effective students' learning in Kwara State COEs. It was recommended that the management of the Kwara State Colleges of Education should periodically organise AI workshops and lectures for students to acquaint them with various available AI tools and equip them with the skills required to utilise those tools to enhance their effective learning.

96. Influence of Artificial Intelligence Tools and Social Media Usage on Entrepreneurial Performance of Domino'S Pizza in Benin Metropolis, Edo State, Nigeria

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This study examined the influence of artificial intelligence (AI) tools and social media usage on the entrepreneurial performance of Domino's Pizza in Benin Metropolis, Edo State, Nigeria. Specifically, the study investigated the effects of AI-powered marketing and personalisation, AI-based customer service systems, advertising and promotions, and customer engagement on entrepreneurial performance. The study was anchored on the Technology Acceptance Model (TAM), which explains the adoption and utilisation of technological innovations in organisations. A descriptive survey research design was adopted, and a census of 45 employees from the two Domino's Pizza outlets in Benin Metropolis was conducted. Data were collected using a structured questionnaire validated by experts, with reliability coefficients ranging from 0.77 to 0.83. Data were analysed using multiple regression analysis with SPSS Version 22. Findings revealed that Advertising and Promotions ($\beta = 0.509$, $p = 0.001$) and Customer Engagement ($\beta = 0.344$, $p = 0.027$) had significant positive effects on entrepreneurial performance. Conversely, AI-Powered Marketing and Personalisation ($\beta = -0.173$, $p = 0.130$) and AI-Based Customer Service Systems ($\beta = 0.143$, $p = 0.205$) did not significantly influence entrepreneurial performance. The findings suggest that social media-driven customer interaction contributes more substantially to entrepreneurial performance than standalone AI applications within the study context. The study concludes that the effectiveness of AI tools depends largely on their strategic integration with customer-oriented business practices. It recommends sustained investment in social media advertising, promotional activities, and customer engagement strategies, alongside the adoption of AI technologies that complement human interaction to enhance entrepreneurial outcomes.

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97. Integrating Artificial Intelligence and Emerging Technologies in the Teaching-learning Process of Tertiary Institutions in Nigeria: Opportunities, Challenges, and Future Directions

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The rapid advancement of Artificial Intelligence (AI) and emerging digital technologies is transforming higher education globally. In Nigeria, tertiary institutions are increasingly exploring AI-driven solutions to improve teaching effectiveness, learning outcomes, research productivity, and institutional management. Technologies such as generative AI, machine learning, learning analytics, virtual reality (VR), augmented reality (AR), adaptive learning systems, educational chatbots, and intelligent tutoring systems offer unprecedented opportunities for personalized and inclusive education. However, their integration faces numerous challenges, including inadequate digital infrastructure, insufficient funding, low digital literacy, ethical concerns, data privacy issues, and policy gaps. This review examines the current status of AI and emerging technologies in Nigerian tertiary institutions, explores their applications in teaching and learning, identifies major barriers to adoption, and proposes strategies for sustainable integration. The paper concludes that while AI has significant potential to revolutionize higher education in Nigeria, its successful implementation requires coordinated investments in infrastructure, human capacity development, policy frameworks, and ethical governance.

Keywords: *Artificial Intelligence, Emerging Technologies, Generative AI, Higher Education.*

98. Integrating Artificial Intelligence and Emerging Technologies into Computing Education: Implications for Curriculum Development, Teaching, Assessment, and Future Employability

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Artificial intelligence (AI) and emerging technologies are reshaping computing education by influencing curriculum design, instructional practices, assessment approaches, and graduate preparation. Educational institutions are increasingly challenged to integrate these technologies while preserving learning quality, academic integrity, and workforce relevance. This study synthesizes contemporary evidence on the integration of artificial intelligence and emerging technologies into computing education to examine their implications for curriculum development, teaching, assessment, and graduate employability. Evidence from current educational research was critically analyzed to identify emerging trends, implementation challenges, and effective practices across these interconnected dimensions. The synthesis indicates that AI has considerable potential to enhance curriculum modernization, personalized teaching, learner engagement, and employability-oriented skill development. Persistent challenges include educator preparedness, ethical concerns, assessment validity, learner overreliance on AI-generated content, and disparities in institutional readiness. The study proposes an integrative educational framework that aligns curriculum reform, AI-supported pedagogy, authentic assessment, and employability competencies to promote responsible AI adoption in computing education. Effective integration of AI into computing education requires coordinated curriculum reform, continuous professional development for educators, innovative assessment practices, and stronger collaboration between educational institutions and industry. The proposed framework offers practical guidance for educators, curriculum developers, institutional leaders, and policymakers seeking to prepare graduates with the knowledge, skills, and ethical competencies required in an AI-enabled educational and professional environment.

99. Integrating Generative AI Tools into Technical Project-Based Learning: Opportunities, Challenges and Pedagogical Strategies

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This research investigates the integration of Generative Artificial Intelligence (GenAI) tools into Project-Based learning (PBL) within technical education. It explores opportunities such as enhanced creativity, accelerated prototyping, improved documentation efficiency, and personalized troubleshooting support. The study also identifies and discusses challenges to the integration of GenAI such as threats to foundational skill development, academic integrity concerns, potential bias in outputs, and difficulties in authentic assessment. The study critically examines how students utilize these tools throughout the technical project lifecycle and evaluates their perceived impact on learning processes and outcomes. Furthermore, it identifies, develops, and assesses pedagogical strategies teachers can employ to leverage GenAI effectively. The research employs a mixed-methods approach to develop and test practical pedagogical frameworks. The findings aim to provide evidence-based guidance for educators and institutions wanting to integrate GenAI into hands-on technical curricula, preparing graduates who are both technically proficient and ready to

collaborate responsibly with AI.

100. Language and Communication Skills in Higher Education in Nigeria: The Emergence of Artificial Intelligence (AI)

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The rapid integration of Artificial Intelligence (AI) is radically restructuring how lecturers of higher education in Nigeria approach language and literacy. This paper dives into the role AI plays in teaching communication skills within Nigerian higher institutions, looking closely at the fresh opportunities it brings, the hurdles it introduces, and its broader impact on language education. Communicative competence is all about a learner's ability to use language accurately, appropriately, and meaningfully in real-world scenarios. Historically, campuses in Nigeria have built these skills through classic classroom dynamics: face-to-face lectures, group discussions, and student presentations. Today, however, AI-powered tools are opening doors to highly personalized, interactive, and tech-driven language learning. We explore how smart tutoring systems, chatbots, writing assistants, speech recognition tech, and adaptive learning platforms can help students sharpen their speaking, listening, reading, writing, and social language skills. AI offers instant feedback, mimics real-life conversations, encourages independent study, and helps lecturers spot exactly where a student is thriving or struggling. Yet, bringing AI into Nigerian classrooms isn't without its roadblocks. Institutions face poor digital infrastructure, a tech-skills gap among both staff and students, unequal access to devices, data privacy worries, cheating risks, and the danger of students relying too heavily on automated answers. There is also the vital question of whether AI-generated content genuinely fits Nigeria's rich cultural context. This paper argues that AI should be a partner to, not a replacement for, human students and lecturers. Making this work requires real investment in tech infrastructure, ongoing training for educators, clear school policies, ethical guidelines, and teaching methods that encourage students to think critically about AI. Ultimately, if integrated thoughtfully and responsibly, AI can breathe new life into language classrooms, making the learning of communication skills in higher education in Nigeria more inclusive, flexible, and deeply effective.

Keywords: *Communication, higher institutions, communication skills, communicative competence, Artificial Intelligence (AI)*

101. Lecturers' Perception towards the Use of Cloud Computing Resources for Teaching and Learning in Shehu Shagari College of Education, Sokoto

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The study examined lecturers' perception towards the use of cloud computing resources for teaching and learning in Shehu Shagari College of Education, Sokoto. This study focused on the aspect of cloud computing resources for teaching and learning such as research, collaboration and communication, video conferencing and virtual classrooms, cloud storage and file sharing, and assessment and evaluation. The study set two objectives, namely to find out how lecturers perceive cloud computing resources for teaching and learning in Shehu Shagari College of Education, Sokoto, Nigeria, and to determine how lecturers perceive the use of those resources. Two research questions and hypotheses were formulated in line with the objectives. Theories of evaluation, the Technology Acceptance Model 3 and the theory of constructivism of teaching were used. A descriptive survey research design with a population of 557 academic staff and a sample of 357 lecturers was used, based on Research Advisor (2006). A random sampling technique was used. A self-developed questionnaire titled Lecturers' Perception Towards Use of Cloud Computing Questionnaire was used for data collection; the questionnaire has twenty items. Data were analysed using descriptive statistics of frequency count, simple percentages, cross tabulation and graphical illustration for the demographic data, and mean, cross tabulation, frequency counts, percentages and standard deviation to answer the research questions. The research hypotheses were tested using Chi-Square at the 0.05 level of significance. Findings revealed that the challenges faced by lecturers in the use of cloud computing resources for teaching and learning include internet access, lack of basic skills among lecturers, network problems, data security and privacy concerns, limited infrastructure, financial constraints and cultural resistance. There was a significant difference in lecturers' perceptions towards the use of cloud computing (Chi-square = 27.367, p = 0.038, P< .05). There was a significant difference in the attitude of lecturers towards cloud computing (Chi-square = 31.626, p = 0.012, P< .05). The study concluded that lecturers generally recognise the potential of cloud computing to enhance teaching methodologies and improve access to educational resources, and that their perception underscores a readiness to embrace innovative tools that can transform traditional pedagogical practices. It was recommended that the school authority, in partnership with cloud computing

experts, should minimise the challenges facing lecturers in Shehu Shagari College of Education, Sokoto.

Keywords: *Lecturers, perception, cloud computing*

102. Lecturers' Technology Acceptance and Use of Ai-Powered Tools in Enhancing Classroom Instructional Engagements in Colleges of Education in Nigeria

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This research examined the influence of lecturers' technology acceptance and use of AI-Powered tools on classroom instructional engagements in Federal College of Education, Ididep, Akwa Ibom State, Nigeria. Two hypotheses were formulated and tested at 0.05 level of significance. The study adopted descriptive survey research design and the population of the study consist of 148 (66 females and 82 males) lecturers and all the 587 year 2 pre-service teachers in the Federal College of Education, Ididep, 2025/2026 session. Census and Purposive sampling techniques were used for the study to select the entire 148 lecturers and 400 pre-service teachers that constituted the sample. The two validated for the study were 'Lecturers' Technology Acceptance and Use of AI-Powered Tools Questionnaire (LTAUAITPTQ) and Pre-Service Teachers' Classroom Instructional Engagements Questionnaire (PSTCIEQ)' were used to collect the required data. The reliability of the instrument was established using split-half method which yielded indices ranged from 0.76 and 0.87 which showed that the instrument was consistent in measuring what they were meant to measure. Analysis of variance (ANOVA) was used to analyse the collected and prepared data for all the hypotheses; at 0.5 level of significance. The result revealed that lecturers' technology acceptance and use of AI-Powered tools had significant influence on classroom instructional engagements. It was recommended among others that regular training and capacity-building programmes should be conducted at educational institutions to boost lecturers' understanding, skills, and confidence in using AI teaching assistants to engage students in the classroom.

103. Leveraging Digital Technologies for Climate Change Mitigation and Adaptation in Future-Ready Higher Education Ecosystems in Africa

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Climate change has been one of the most imperative challenges confronting the entire world and, to be specific, Africa in the twenty-first century. The continent is highly vulnerable to meteorological and other environmental hazards, including droughts, floods, desertification, biodiversity loss, food insecurity, and public health crises. At the same time, African higher education institutions are undergoing digital transformation to meet the demands of the current industrial revolution of digitalization. This paper examines how digital technologies can be leveraged to strengthen climate change mitigation and adaptation efforts within future-ready higher education ecosystems in Africa. Drawing on contemporary literature and policy frameworks, the study explores the role of Artificial Intelligence (AI), Geographic Information Systems (GIS), remote sensing, e-learning platforms, cloud computing, and the Internet of Things (IoT), among other technologies, in climate education, research, innovation, and institutional sustainability. The paper further identifies challenges such as inadequate digital infrastructure, funding constraints, digital inequality, and limited technical capacity. It concludes with recommendations for strengthening digital climate literacy, promoting interdisciplinary research, enhancing institutional partnerships, and investing in climate-smart digital ecosystems such as climate-resilient agriculture. The study argues that digital technologies provide a transformative pathway for African higher education institutions to become catalysts for climate resilience and sustainable development.

Keywords: *Climate change, digital technologies, higher education, climate adaptation*

104. Machine Learning Based Attacks Detection in Wireless Sensor Network: A Review

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Wireless Sensor Networks (WSNs) have become foundational to a wide range of data-centric and Internet of Things (IoT) applications, yet their constrained energy, memory, and processing resources, combined with dynamic topologies, expose them to a growing spectrum of security threats. Conventional signature-based and rule-based intrusion detection systems (IDS) are poorly suited to these environments because they cannot adapt to novel attack

patterns and impose computational burdens that drain limited node resources. This review examines how machine learning (ML) techniques can enhance attack detection in WSNs by enabling nodes to autonomously learn complex attack signatures and respond adaptively to evolving threats. We survey and categorize ML-based IDS approaches spanning supervised, unsupervised, ensemble, deep learning methods and assess their effectiveness against representative WSN attacks such as denial-of-service, blackhole, Sybil, selective forwarding, and data integrity tampering. Particular attention is given to the central trade-off between detection accuracy and the energy and computational overhead of resource-constrained sensor nodes. The findings indicate that ML-based detection consistently outperforms static approaches in identifying anomalous and previously unseen behaviours, but that practical deployment hinges on lightweight model design, efficient feature selection, and energy-aware implementation. This work consolidates current research to offer actionable guidance for building robust, energy-efficient security frameworks suitable for long-term operation in heterogeneous WSN architectures.

Keywords: *Wireless sensor network, Intrusion detection system, Machine learning, Anomaly detection and Internet of Things*

105. Mathematical Modelling, Artificial Intelligence and Numerical Simulation of Crop-Pest Interactions for Sustainable Agricultural Production and Food Security

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Crop production is significantly affected by the dynamic interactions between crop growth, pest infestation, environmental conditions and pest-management interventions. Understanding these interactions is essential for improving agricultural productivity, reducing crop losses and ensuring food security. This study proposes an integrated structure combining mathematical modelling, artificial intelligence and numerical simulation to investigate crop-pest population dynamics and evaluate sustainable pest-management strategies. A system of coupled nonlinear ordinary differential equations is formulated to describe logistic crop growth, pest-induced crop damage, pest reproduction, natural mortality and pest-control interventions. The mathematical model is analysed to establish positivity, boundedness, equilibrium states and local stability conditions. Numerical solutions are obtained using the fourth-order Runge-Kutta method to examine the effects of pest reproduction, crop carrying capacity, pest attack rate and pest-control intensity on crop biomass and pest population. Artificial intelligence is incorporated through machine-learning techniques, including Artificial Neural Networks (ANNs), Random Forest Regression and Long Short-Term Memory (LSTM) networks, to predict crop biomass, estimate pest population trends and identify patterns associated with infestation risks. The AI models are designed to learn from numerical simulation outputs and, where available, observed agricultural datasets containing crop growth, pest abundance, rainfall, temperature, pesticide application and other relevant environmental variables. Their predictive performance will be evaluated using the Root Mean Square Error, Mean Absolute Error and coefficient of determination. A hybrid modelling framework is further proposed to integrate mechanistic predictions with data-driven learning, enabling comparison between conventional numerical simulations and AI-assisted forecasts. Sensitivity analysis and scenario-based simulations will be used to assess how changes in biological parameters and pest-management interventions influence agricultural productivity. The integrated structure is expected to support early pest-risk identification, improved pest-control decisions and more reliable crop-production forecasts. By combining mathematical analysis, numerical simulation and artificial intelligence, the study aims to provide a quantitative decision-support framework for sustainable agricultural production, efficient pest management and food security.

Keywords: *Crop-pest interactions, mathematical modelling, artificial intelligence, machine learning, numerical simulation, artificial neural networks, pest population dynamics, sustainable agriculture, food security, integrated pest management*

106. Measuring cognitive load, metacognition, and dynamic feedback processing during real-time interactions with Generative AI and AI tutors

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The integration of Generative AI and intelligent tutoring systems (ITS) into higher education has fundamentally altered student-content interaction, yet its cognitive and psychological overhead remains under-explored. This study investigates the real-time cognitive dynamics specifically germane, intrinsic, and extraneous cognitive load—alongside metacognitive monitoring and dynamic feedback processing when students interact with adaptive AI tutors. Utilizing a multi-modal data collection framework combining psychometric inventories, real-time eye-tracking, and interaction-log analytics, we monitored undergraduate students engaged in complex problem-solving tasks with

generative conversational agents. Findings indicate that while real-time, personalized AI feedback reduces extraneous cognitive load and accelerates error recovery, excessive conversational AI assistance can inadvertently suppress metacognitive calibration, leading to over-reliance and surface-level information processing. Conversely, scaffolding AI feedback with delayed-prompt interventions significantly heightened metacognitive awareness and deep conceptual retention without causing cognitive overload. By mapping the exact cognitive trade-offs involved in dynamic human-AI learning interactions, this paper establishes an empirical foundation for designing psychologically optimized AI tutoring systems that foster autonomous, higher-order thinking while safeguarding cognitive well-being in digital higher education ecosystems.

107. Preparing Future Teachers for the AI Era: Integrating Information Literacy and Digital Competence for Future-Ready Teacher Education in Nigerian Colleges of Education

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The rapid proliferation of Artificial Intelligence (AI) across global educational ecosystems necessitates an urgent transformation in teacher preparation paradigms, particularly within developing nations such as Nigeria. Thus, this study investigates the integration of information literacy and digital competence as foundational pillars for cultivating future-ready teacher educators and pre-service teachers in Nigerian Colleges of Education. The study adopted a descriptive survey research design. The study population comprised all student-teachers and educators in three colleges of education in southwest Nigeria. Using simple random sampling technique, 30 student-teachers and 30 young lecturers were selected in each of the colleges of education to have 180 as sample for the study. Three research objectives and corresponding questions guided the investigation, alongside two null hypotheses tested at a 0.05 level of significance. Data were gathered using a structured, validated four-point Likert scale questionnaire and analyzed using mean, standard deviation, and independent samples t-tests. The findings reveal a critical deficit in pre-service teachers' advanced AI operational skills and information evaluation frameworks, despite a high general awareness of digital tools. Furthermore, results indicate a statistically significant positive relationship between institutional digital infrastructure support and pedagogical AI readiness. The study concludes that systemic curriculum redesign, robust infrastructural investments, and targeted faculty upskilling are imperative to bridge the current competence gap. Consequently, recommendations include the mandatory integration of AI literacy modules into the National Certificate in Education (NCE) minimum standards, setting up AI learning laboratories for teacher education, and sustained professional development initiatives among others.

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Keywords: *Artificial Intelligence, Information Literacy, Digital Competence, Teacher Education, Colleges of Education, Nigeria.*

108. Project Management Practices and AI-Enabled Digital Transformation: Evidence from the South-East Regional Offices of Selected Deposit Money Banks in Nigeria

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Artificial Intelligence (AI) is accelerating digital transformation across the banking sector, yet many initiatives fail to achieve their intended outcomes due to ineffective project management. This study proposes to evaluate the effect of project management practices on AI-enabled digital transformation in the South-East Regional Offices of selected Deposit Money Banks in Nigeria. Specifically, the study examines the influence of project integration management, project stakeholder management, and project risk management on the successful implementation of AI-enabled digital transformation initiatives. Guided by the Dynamic Capabilities Theory, the study will adopt a descriptive survey design, targeting managerial and professional staff involved in digital transformation projects. Data will be collected through a structured questionnaire and analyzed using descriptive statistics and multiple regression analysis. The study is expected to generate empirical evidence on the project management practices that drive successful AI-enabled digital transformation and provide practical insights for bank executives, project managers, and policymakers seeking to enhance innovation, operational efficiency, and sustainable competitiveness in Nigeria's banking industry.

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109. Reimagining Student Research Assessment for Future-Ready Higher Education: AI, Ethics and Innovation in African Contexts

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Artificial Intelligence (AI) and emerging technologies are reshaping knowledge creation for learning and assessment in higher education worldwide, especially in Africa. Traditional student research assessment approaches are increasingly challenged by AI-assisted writing, automated content generation, and digital research tools. This paper argues for a shift from product-focused assessment towards approaches that value research processes, critical thinking, ethical AI use, creativity, collaboration, and authentic knowledge creation. Drawing on current perspectives on authentic assessment, digital scholarship, and AI-enabled education, the paper proposes a Future-Ready Research Assessment Framework built around five key dimensions: transparency of the research process, authentic knowledge development, ethical AI engagement, multimodal evidence of learning, and continuous feedback and reflection. The paper further highlights practical strategies such as research portfolios, oral presentations, reflective journals, AI-use declarations, peer review, and technology-supported feedback. Considering the policy, infrastructural, and institutional realities of African higher education, particularly Nigeria, the paper emphasizes the need for responsible AI integration, staff capacity development, and effective governance frameworks. It concludes that transforming research assessment is essential for developing graduates equipped with the skills, ethics, and creativity required for future academic and professional environments.Keywords: Artificial Intelligence, Authentic Assessment, Higher Education, Research Assessment, Emerging Technologies, African Education

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110. Research Ecosystem Transformation in Nigerian University Libraries using AI-Enabled Services

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By rethinking how knowledge is produced, accessed, and shared, artificial intelligence (AI) is radically changing the research environment. This paper will look at how AI-enabled services are transforming Nigeria's research landscape. It will explore how university libraries are leveraging AI technologies to enhance research support, improve information discovery, and increase scholarly productivity. The objectives of the study will include highlighting key AI applications, examining the role of AI in transforming research services, identifying AI tools used in research support, assessing the impact of AI-enabled services on research productivity, and exploring the challenges associated with AI adoption in Nigerian university libraries. The methodology to be adopted will be a descriptive approach, with the population comprising librarians, researchers, and postgraduate students. Data will be collected via questionnaires and documentary sources and analysed statistically.

111. Risks of Large Language Models in Nigerian Tertiary Education: Governance, Assessment and Best-Practice Recommendations

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Large language models (LLMs) have entered Nigerian universities, polytechnics and colleges of education faster than institutional policy has adapted. This paper offers a conceptual analysis of the risks that LLM use poses to tertiary education in Nigeria and proposes a practical framework for managing them. Drawing on published research on language model limitations, educational applications of LLMs, AI-text detection, international guidance and Nigeria's data protection and AI policy documents, we identify six priority risks: erosion of academic integrity, cognitive over-reliance, hallucinated content, linguistic and cultural bias, data privacy exposure, and unequal access. We argue that prohibition is unenforceable and that unmanaged adoption is unsafe. The paper recommends governed, transparent and assessment-led integration, set out as actions for institutions, lecturers, students and national regulators, with a phased implementation sequence. The analysis is conceptual and calls for empirical testing across Nigerian institutional types.

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Keywords: *large language models; generative AI; tertiary education; Nigeria; academic integrity; AI governance; assessment design*

112. Role of Artificial Intelligence (AI) in Shaping the Future of Higher Education in Selected Institution in Mainland LGA of Lagos State Nigeria

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The integration of Artificial Intelligence (AI) into higher education is rapidly transforming teaching, learning, research, and administrative processes globally. This study examines the role of Artificial Intelligence in shaping the future of higher education in selected higher institutions in Mainland Local Government Area of Lagos State, Nigeria. The study is anchored on the is anchored on the Technological Acceptance Model (TAM) and Diffusion of Innovation Theory to understand how lecturers and students perceive, adopt, and utilize AI tools. The research adopts a mixed method design, combining quantitative survey questionnaires with qualitative interviews to gather data from lecturers and students across selected higher institutions – Federal College of Education (Technical), University of Lagos and Yaba College of Technology. The study investigates the extent of AI adoption, its impact on personalized learning, assessment automation, academic research, and challenges to implementation such as digital literacy, infrastructure deficit, cost, and ethical concerns. Findings reveal that while AI tools like chatbots, adaptive learning platforms, and plagiarism detection software are gradually being adopted, the level of integration remains uneven due to poor internet access, inadequate training, and resistance to change. The study concludes that AI has significant potential to enhance access, quality, and relevance of higher education in Mainland LGA, but requires strategic investment in infrastructure, policy reform, and capacity building. It recommends curriculum redesign to embed AI literacy, collaboration between institutions and tech firms, and development of ethical guidelines to ensure responsible use. This research contributes to literature on digital transformation on Nigerian tertiary education.

113. Safeguarding Trust in Digital Communication: A Fine-Tuned BERT Approach to Spam Email Detection

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Digital communication has become an essential part of how individuals and organizations interact, exchange information, and build trust. However, spam emails can disrupt these interactions, reduce the reliability of digital communication, and expose users to security and privacy risks. This study investigates BERT-based spam detection from a performance and trust perspective, examining how automated classification can support safer and more trustworthy digital communication. Four approaches were developed and evaluated on the same email dataset and evaluation setting: Random Forest, Support Vector Machine, and Logistic Regression classifiers using frozen BERT embeddings, alongside an end-to-end fine-tuned BERT model. The fine-tuned BERT model achieved an accuracy of 98.65%, precision of 99.65%, recall of 95.67%, and an F1-score of 97.62%, giving the highest accuracy, precision and F1-score of the four approaches and wrongly flagging only one legitimate email, although the SVM and Logistic Regression classifiers achieved higher recall. Beyond predictive performance, the study examines the implications of AI-assisted content filtering for human judgment, privacy, trust, and responsible decision-making in digital communication. The findings highlight how transformer-based AI can support users in identifying unwanted communication, while acknowledging the risks of false positives, false negatives, and inappropriate handling of sensitive email content. Accordingly, the study advocates deploying automated detection as support for, rather than a replacement of, human judgment, emphasizing privacy protection, responsible deployment, and meaningful human oversight in AI-enabled digital communication.

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114. Science Graduates' Digital Learning Gap and Future-Ready Competency Needs: Informing Smarter Campus Transformation in African Higher Education

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As the global landscape of the world-of-work increasingly changes towards digital terrain, there are growing concerns to prepare science graduates towards meaningful contribution to the labour market. This study therefore examined digital learning gaps and future-ready competency needs of science graduates; with a view to provide evidence-based recommendations for smart-campus transformation initiatives in African higher education. The research design was a descriptive survey. The sample of this study was made up of 62 Colleges of Education science graduates who completed their National Certificate in Education programme within the last five years. A structured questionnaire with Cronbach alpha of 0.79 was used to collect data. The data collected were analysed using mean, standard deviation and Analysis of Variance (ANOVA). The major learning gaps identified by these graduates were: hands-on incompetence and struggling to transfer theoretical knowledge acquired in school to real industry or research workflows. Premised on these findings, it is therefore recommended that higher institutions provide Smart-campus experiences that will offer practical data literacy and modern digital tools, to prepare students for the world-of-work. To consolidate this, students should be exposed to digital internships, mentorships, and project-based learning with real datasets.

115. Science Teachers Perception of Integration of Artificial intelligence Based tools into classroom Interaction in Kano State

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cience education is an essential gateway to technological development of a nation. Its teaching and learning can indeed be quite difficult and challenging as it involves abstract and complex concepts. It has being an arguments, that emerging technologies can assist in addressing science teaching and learning challenges when properly utilized. This study examines the perceptions of science teachers in integration of artificial intelligence into classroom interactions. One hundred and fifty science teachers from 35 public and 20 private secondary schools participates in the study. Stratified and purposive sampling techniques were used to select the schools and the teachers respectively. A research designed questionnaire was used in data collection and analysed using the t-test statistical tool. The findings from the study revealed that teachers have high perceptions of integration of AI- tools in classroom. This indicates teachers see AI as a valuable tool to enhance students' engagement and provide personalized feedback. Challenges such as teachers training and curriculum alignment are identified along with strategies to overcome them. The study also recommends teachers to progress in integrating AI tools into classroom, tailoring professional development for science teachers, Curriculum alignment with AI activities and fostering a culture of collaboration and engagement among students using AI – supported tools. Keywords: AI, Classroom, perceptions, Science teachers, Teaching and learning

116. Students' Trust in Generative AI and Their Intention to Use AI for Academic Learning in Colleges of Education in Nigeria

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The research aims to evaluate students' trust in generative artificial intelligence (AI) and their intention to use AI for academic learning in Federal College of Education, Ididep, Akwa Ibom State, Nigeria. Two hypotheses were formulated and tested at 0.05 level of significance. The study adopted descriptive survey research design and the population of the study consist all the 587 year 2 students in the Federal College of Education, Ididep, 2025/2026 session. Purposive sampling techniques was used for the study to select 300 students that constituted the sample. A well validated 'Students' Trust in Generative AI Questionnaire (STGAIQ) and Students' Intention to Use AI for Academic Learning Questionnaire (SIUAIALQ) were used to collect the required data. Simple Linear Regression was the statistical tools used for analysis of the data collected. The result of the analysis revealed that there is a significant influence of students' trust in generative AI on the pre-service teachers' intention to use AI for academic learning. Also, there is a significant gender difference in students' trust in generative AI on their intention to use AI for academic learning. Sequel to the findings of this study, it was recommended, among others that teacher education institutions should work on building students' trust in generative AI by offering structured training that covers the capabilities, limitations, accuracy, and responsible use of AI tools like ChatGPT. This approach will help pre-service teachers gain a well-rounded confidence in utilizing generative AI for their academic pursuits.

117. Synergizing Artificial Intelligence and Human Intelligence for Enhanced Teaching and Learning Effectiveness in Tertiary Institutions in Nigeria

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The increasing adoption of AI-driven technologies such as generative AI tools, virtual learning platforms, and intelligent educational applications in Nigeria tertiary institutions has created new opportunities for improving instructional delivery, academic research, and learning effectiveness. However, concerns regarding excessive dependence on AI, declining creativity, weakened critical thinking, academic laziness, and threats to academic integrity have continued to generate scholarly debate. Hence, the study examined the synergy between Artificial Intelligence and Human Intelligence for enhanced teaching and learning effectiveness in tertiary institutions. The study specifically investigated the extent of AI utilization in tertiary institutions, the influence of AI-human collaboration on educational effectiveness, the perceived effects of excessive dependence on AI on creativity and academic integrity, and strategies for ethical and responsible integration of AI in higher education. The study adopted a descriptive survey research design. A total of 150 respondents comprising 100 lecturers and 50 students were sampled from selected tertiary institutions in Lagos State using multistage sampling technique. Data were collected using a structured questionnaire titled “Artificial Intelligence and Human Intelligence Synergy Questionnaire” (AIHISQ) administered through Google Forms. The data collected were analyzed using percentage, mean score, and standard deviation. The findings revealed that Artificial Intelligence is widely utilized in teaching and learning activities within tertiary institutions and that effective collaboration between AI and Human Intelligence significantly enhances academic productivity and learning effectiveness. The study further revealed that excessive dependence on AI may negatively affect creativity, originality, critical thinking, and academic integrity among lecturers and students. The study concluded that Artificial Intelligence should complement rather than replace Human Intelligence. The study recommended ethical AI policies, AI literacy training, critical thinking promotion, and responsible integration of AI technologies within tertiary institutions.

118. Teachers' Perception of Artificial Intelligence and Teaching Innovative Classroom Practices in Public Secondary Schools in Akwa Ibom State, Nigeria

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Poor teaching classroom practices are ineffective classroom practices that restrict students to passive learning, limited critical thinking and limited meaningful learning experiences. Literature tells that educational technologies innovative teaching techniques aid motivation, engagement and academic performance of learners. This research aims to ascertain the influence of teachers' perception of artificial intelligence and innovative classroom practices in public secondary schools in Ibiono Ibom Local Government Area, Akwa Ibom, Nigeria. Two hypotheses were formulated and tested at 0.05 level of significance. The study adopted correlation research design and the population of the study consist of 148 teachers and all the 587 SS 2 students in 2025/2026 session. Accidental sampling and purposive sampling techniques were used for the study to select 150 teachers and 300 students that constituted the sample. A well validated ‘Teachers' Perception of Artificial Intelligence Questionnaire (TPAIQ) and Teaching Innovative Classroom Practices Questionnaire (TICPQ)’ were used to collect the required data. Simple Linear Regression was the statistical tools used for analysis of data collected. The result of the analysis revealed that there is a significant influence of teachers' perceived usefulness and teachers' attitude toward AI on teachers' innovative classroom practices in public secondary schools. Sequel to the findings of this study, it was recommended, among others that school administrators and education authorities should arrange regular training, workshops, and capacity building initiatives on the use of AI in education, to help raise the awareness of teachers around its usefulness and build their confidence to use AI in their classes.

Keywords: *Teachers' perception, Artificial intelligence, Teaching Innovative Classroom Practices*

119. Technology Acceptance and Utilization of AI Tools among Biology Lecturers in Colleges of Education in South-East Nigeria

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The increasing integration of Artificial Intelligence (AI) into higher education presents new opportunities for enhancing teaching, assessment, research, and academic productivity. Despite the growing relevance of AI

technologies, little is known about their acceptance and utilization among Biology lecturers in Colleges of Education in Nigeria. This study investigated the level of acceptance and utilization of AI tools among Biology lecturers in Colleges of Education in South-East Nigeria and examined the factors influencing their adoption. The study adopted a descriptive survey research design grounded in the Technology Acceptance Model (TAM). A sample of 312 Biology lecturers was selected through a multi-stage sampling procedure. Data were collected using a validated questionnaire titled "Artificial Intelligence Acceptance and Utilization Scale (AIAUS)", with a reliability coefficient of 0.91. Descriptive statistics and multiple regression analysis were used to analyze the data at a 0.05 level of significance. The findings revealed that Biology lecturers demonstrated a high level of awareness and positive acceptance of AI tools. However, the extent of pedagogical utilization was moderate. Perceived usefulness, perceived ease of use, digital competence, and institutional support significantly influenced AI utilization, while concerns regarding ethical issues, data privacy, inadequate infrastructure, and limited professional development opportunities constituted major barriers to adoption. The study further found that digital competence significantly enhanced the relationship between AI acceptance and actual utilization. The study concludes that although Biology lecturers are receptive to AI technologies, effective integration into teaching and learning requires strengthened digital capacity, institutional support, and targeted professional development. The findings provide empirical insights for advancing AI-driven innovation in biology teacher education and promoting future-ready higher education systems in Nigeria. It is recommended that Colleges of Education develop comprehensive AI literacy and capacity-building programmes to facilitate sustainable adoption and effective utilization of AI tools.

Keywords: *Artificial Intelligence, Technology Acceptance, AI Utilization, Biology Education, Digital Competence, Teacher Education.*

120. The Human Algorithm: Reclaiming Learner-Centred Pedagogy in an Age of Generative AI (Gen AI)

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Generative AI tools is increasingly used in higher insulation, yet their impact onlearner- centred Pedagogy remain unclear. This study survey 80 students and staff to examine how Gen AI is used and whether it supports self- regulated learning, and what challenges arise. Results show that while most users find Gen AI useful for completing tasks quickly, very few receive formal training or clear institutional guidelines. Self-regulated learning behaviours such as goal setting, accuracy checking, and reflection are weak. Many respondents admitted to submitting AI-generated content without changes, and there is widespread concern that over-reliance harms critical thinking and encourage laziness. Institutional policies are largely absent, leaving users to navigate ethical and pedagogical dilemmas alone. The paper proposes a human- algorithm framework that positions AI as a structured collaborative partner rather than a shortcut. Key recommendations include mandatory AI literacy training, redesign assessment to prioritise process over product, and sustained professional development for educators. Without deliberate pedagogical scaffolding, Gen AI risks eroding the very skills that higher education aims to develop.

121. The important of Artificial Intelligent (AI) in the advancement of Teacher Education Programmes in Nigeria

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The integration of Artificial Intelligence (AI) into teacher education programs in Nigeria addresses the need for contemporary teaching skills suitable for the 21st century. This paper explores how AI enhances various facets of teacher education, such as personalized learning,student assessment, and educational research. AI-powered educational platforms offer customized learning experiences, while AI-based assessment tools enable quick identification of student struggles, allowing for targeted interventions. Furthermore, AI facilitates the analysis of large datasets in educational research, providing insights that inform teaching practices. This study employs a mixed-methods approach, combining quantitative data analysis with qualitative interviews to understand the impact of AI on teacher training. Findings indicate that AI can significantly improve the efficiency and effectiveness of teacher education programs by offering personalized training, improving lesson planning, and providing real-time feedback. The conclusions underscore the potential of AI to transform teacher education in Nigeria, emphasizing the need for investment in AI technologies and teacher training to fully realize these benefits.

Keywords: *Artificial Intelligence (AI), Teacher Education, Teaching and Learning*

122. The Influence of Google Classroom on Learning Mathematics: Student Engagement and Performance in Secondary Schools

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The study investigates the effect of Google classroom on secondary school students' performance in mathematics. Two research questions and two hypotheses guided the study which adopted pretest posttest non-equivalent group quasi-experimental design. The sample is comprised of 67 SS2 students in two intact classes drawn using purposive sampling technique. Data were collected using 'Students' Learning Engagement Questionnaire' (SLEQ) and 'Mathematics Achievement Test' (MAT) whose reliability indices were 0.76 and 0.74 obtained using Cronbach Alpha and Kuder-Richardson20 methods respectively. Mean (x) and standard deviation (SD) were used to answer the research questions while Analysis of Covariance (ANCOVA) was used to test the hypotheses at .05 level of significance. Results show that face-to-face method has a significantly positive effect on students' engagement in mathematics than Google classroom while Google classroom has a significant positive effect on students' achievement in Mathematics than face-to face. It was recommended that Google classroom should be used in the teaching of mathematics in schools.

123. The role of AI-Enhanced Digital Learning in Promoting Entrepreneurship Skills Among Undergraduate Students in federal College of Education, Yola

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The rapid advancement of artificial intelligence has transformed educational practices worldwide and created new opportunities for entrepreneurship development among students. This study examined the role of AI-enhanced digital learning in promoting entrepreneurship skills among undergraduate students offering Entrepreneurship Education and Skills in Federal College of Education, Yola. Specifically, the study investigated the extent of students' utilization of AI-enhanced digital learning platforms, examined their influence on creativity and innovation skills, assessed their effect on business planning and entrepreneurial decision-making skills, and identified challenges associated with their utilization. The study adopted a descriptive survey research design. The population consisted of 2,272 undergraduate students offering Entrepreneurship Education and Skills across Levels I–IV in Federal College of Education, Yola. Using the Taro Yamane formula and stratified random sampling technique, a sample size of 347 respondents was selected. Data were collected through a structured questionnaire and analyzed using frequency counts, percentages, mean scores, standard deviations, Pearson Product Moment Correlation, and Simple Linear Regression. The findings revealed a high level of utilization of AI-enhanced digital learning platforms among respondents. The study further established that AI-enhanced digital learning significantly enhanced creativity, innovation, business planning, and entrepreneurial decision-making skills. Statistical results indicated a significant positive relationship between AI-enhanced digital learning and entrepreneurship skills, as well as a significant predictive effect on entrepreneurial competence. However, challenges such as inadequate internet access, high data costs, limited institutional support, and insufficient digital infrastructure were identified. The study concluded that AI-enhanced digital learning plays a vital role in entrepreneurship skill development and recommended increased investment in digital infrastructure, institutional support, and AI-based educational innovations.

124. The Role of Librarians in Supporting AI and Digital Technology Integration

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The increasing adoption of artificial intelligence (AI) and digital technologies has transformed the way information is created, organized, accessed and used in educational institutions and society. These developments have also redefined the functions of libraries and the responsibilities of librarians. Modern libraries are no longer limited to the collection and preservation of printed materials, they now serve as important centers for digital information services, technology-supported learning and research support. As a result, librarians play a crucial role in helping users effectively utilize digital resources and technologies. This paper examines the role of librarians in supporting the integration of AI and digital technologies in education and society. It discusses how librarians contribute to digital literacy development, information management and the implementation of technology-based services. The paper reviews the application of AI in library operations including information retrieval, cataloguing, user services and

digital repository management. The study shows that librarians are important stakeholders in promoting access to digital information, supporting teaching and learning, facilitating research activities and reducing inequalities in access to technology and information resources. Despite the challenges associated with digital transformation, librarians continue to acquire new skills and adapt their services to meet changing user needs. The paper concludes that librarians are essential to the successful, ethical and inclusive integration of AI and digital technologies in contemporary education and information services.

Keywords: *Artificial Intelligence, Digital Technologies, Librarians, Digital Literacy, Information Management*

125. Transforming Classroom Practice: Investigating the Influence of Resource-Efficient Educational Technology on Engagement

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This study investigated the influence of resource-efficient educational technology on learners' engagement in tertiary institutions in Lagos State, Nigeria. The study adopted a descriptive survey research design. A total of 250 respondents comprising 200 final year students and 50 lecturers sampled from five selected tertiary institutions in Lagos State using multistage sampling technique. Data were collected through a structured questionnaire administered to the respondents, with the instrument distributed and retrieved via Google Forms to enhance efficiency and accessibility. The data collected were analyzed using simple percentage, mean score, and standard deviation to determine the patterns of responses and the degree of relationship between resource-efficient educational technology usage and engagement-related outcomes. The study further present findings on the level of students' engagement associated with the use of resource-efficient educational technology, and based on these findings, recommendations were provided to guide tertiary institutions, educators, and other stakeholders on effective strategies for adopting and integrating resource-efficient educational technology to improve student engagement especially in learning environments characterized by limited resources. The study concludes that resource-efficient educational technology positively influences students' engagement in Lagos tertiary institutions, especially by improving participation, attention, motivation, and interest. It further indicates that limited funding, poor infrastructure, unreliable electricity, and high data cost can hinder effectiveness, though the challenges can be addressed. Therefore, tertiary institutions should adopt offline-friendly and low-bandwidth tools, train lecturers for effective integration, provide accessible learning resources, and guide students on proper usage, while future research should broaden coverage.

Keywords: *Resource-efficient educational technology; Students' engagement; Behavioral, emotional and cognitive engagement*

126. Transforming Education through Artificial Intelligence: A Comprehensive Review of its Impact on Learning Experiences

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Artificial Intelligence (AI) has emerged as a transformative force in the education sector, reshaping traditional teaching and learning method through innovative technological solutions. This paper provides a comprehensive review of the role of Artificial Intelligence an enhancing learning experiences across various educational levels. The study examines the application of AI-powered tools such as intelligent tutoring systems adaptive learning platforms, automated assessment systems, virtual assistants, and learning analytics in facilitating personalized and efficient learning. The review highlights the benefits of AI in improving student engagement, academic performance accessibility and administrative efficiency. Furthermore, it explores the challenges associated with AI adoption, including data privacy concerns, ethical considerations, technological infrastructure limitations, and the need for digital literacy among educators and learners. Through an analysis of existing literature, the paper demonstrates that AI has significant potential to revolutionize education by creating learner-centered environments that accommodate diverse learning needs. The study concludes that while AI presents numerous opportunities for education advancement, its successful integration requires adequate policy frameworks, stakeholder collaboration, and continuous capacity building. The findings contribute to the growing discourse on the future of education in an increasingly digital world and provide recommendations for maximizing the benefits of Artificial Intelligence in teaching and learning.

127. Transforming Rheumatology Education through Digital Innovation: Leveraging Artificial Intelligence for Early Diagnosis and Improved Patient Care in Africa

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Rheumatic and musculoskeletal diseases constitute a significant public health challenge in Africa, where shortages of specialists, limited diagnostic facilities and inadequate access to medical education contribute to delayed diagnosis and suboptimal patient care. Artificial intelligence (AI) and digital health technologies offer promising opportunities to address these challenges. This paper examines how AI can transform rheumatology education, facilitate early diagnosis and improve healthcare delivery in Africa. Using a narrative review approach, it explores applications of machine learning, digital imaging, telemedicine, virtual learning platforms and AI-assisted clinical decision-support systems. It also considers the opportunities and challenges associated with integrating these technologies into medical education and clinical practice. The paper argues that strategic adoption of AI, supported by appropriate infrastructure, professional training, ethical safeguards and inclusive digital policies, can strengthen rheumatology capacity, expand access to specialist services and improve patient outcomes. It recommends greater investment in digital health education and context-specific technological solutions to build a more accessible and future-ready healthcare system in Africa.

Keywords: *Artificial Intelligence; Rheumatology Education; Digital Health; Early Diagnosis; Telemedicine; Medical Education; Patient Care; Africa.*

128. Use of Artificial intelligence in virtual classroom instruction and students' learning outcome in university of Port Harcourt, Nigeria: Faculty of Education Experience

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Use of Artificial Intelligence in Virtual Classroom Instruction and Students' Learning Outcome in University of Port Harcourt, Nigeria: Faculty of Education Experience.By Akpan, Kufre Paul (Ph.D)Department of Curriculum and Teaching, Federal College of Education Ididep, Akwa Ibom State, Paper Presented at the International Conference of University of Kigali, Kigali, Rwanda on Bridging the Digital Divide: Reimagining Future-Ready Higher Education Ecosystem in Africa, on 23rd -27th November, 2026AbstractThe paper investigated use of Artificial Intelligence (AI) in virtual classroom instruction and students' learning outcome in University of Port Harcourt, Nigeria: Faculty of Education experience. The study was guided by two objectives of the study, two research questions and one hypothesis. The population of the study was made up all the post graduate students in Faculty of Education, University of Port Harcourt, Nigeria for 2024/2025 academic session who are currently on their Post Graduate Diploma in Education (PGDE), Masters in Education (M.Ed.) and Doctor of Philosophy (Ph.D.) programs which is 311 students. (office of the Faculty Officer, Faculty of Education). While the sample for the study was three hundred and eleven (311) students selected using census sampling technique. "Virtual Classroom and Students Learning Outcome Questionnaire (VCSLQ) was used for data collection. Test-re-test method was used to ascertain a reliability coefficient of 0.76. Simple and multiple linear regression analyses were used to answer the research questions and to tests the null hypotheses at .05 level of significance. Findings of the study revealed that there exists a relationship between availability of virtual classroom instruction and students learning outcome in Faculty of Education, University of Port Harcourt. There exists a relationship between the usage of virtual classroom instructional facilities for teaching and learning and students learning outcome in Faculty of Education, University of Port Harcourt. The study recommends that virtual classroom instructional facilities should be made available by the university management for both learners and instructors for easy access to online learning resources. Furthermore, learners and instructors should be encouraged to use virtual classroom facilities for their instructional delivery through training and re-training on virtual education by the university management.

129. Using AI and Renewable Energy to Build Better Learning of Science and Technology Education for Future

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The growing use of artificial intelligence and digital learning platforms has transformed education, but it has also increased energy consumption and environmental impact. This paper explores how combining AI-driven educational

technology with renewable energy sources can create smarter, more sustainable learning systems for the future. The study reviews current approaches to AI in education, focusing on adaptive learning, automated assessment, and personalized content delivery. It then examines how these systems can be powered and optimized using renewable energy technologies such as solar and wind. By integrating energy-aware AI models and edge computing, educational platforms can reduce their carbon footprint, lower operating costs, and extend access to off-grid and low-resource areas. Findings from existing pilot projects show that renewable-powered AI systems can cut energy use by 25–40% without reducing learning performance. These systems also improve reliability and scalability, making quality education more accessible to diverse learners. The paper concludes that aligning AI and renewable energy offers a practical path toward inclusive, low-carbon education. It provides recommendations for designing energy-efficient learning platforms, adopting sustainable infrastructure, and guiding future research on Green AI in education. The work highlights that technology and sustainability can advance together to shape better learning outcomes for the next generation.

Keywords: *Renewable Energy, Green AI, Artificial Intelligence in Education, Sustainable Learning Education and Educational Technology.*

130. Utilisation of Artificial intelligence (AI) in enhancing Teachers' Education in Nigeria

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This paper examined the use of Artificial Intelligence (AI) in enhancing Teachers' Education, and the role of Artificial Intelligence (AI) in incubating and hatching competent, experienced and qualified teachers that will handle all levels of the education system ranging from Pre-Basic, Lower-Basic, Upper-Basic, Secondary Schools, and Tertiary Institutions in Nigeria by way of promoting good, strong and reliable AI-Driven-Teacher-Education in Nigeria, where every prospective teacher has the opportunity to graduate from quality teacher training institute, so as to offer quality services in schools and to produce quality students that are self-reliant and independent; teachers that will explore the environment and be employable after graduation. The paper concludes that Artificial Intelligence (AI)-Driven can enhance teachers' education by way of integrating it into the principle, ethics and methodology of teaching and learning because AI can analyze vast amounts of educational data to provide insights into student performance, teaching effectiveness, and institutional efficiency. Finally, the paper recommended among others that the curriculum of Teacher Education should integrate Artificial Intelligence (AI)-Driven and modern methods of teaching for meaningful developments in Nigeria.

Keywords: *Teacher; Teachers' Education; Artificial Intelligence (AI); Education; Ethics.*

131. Utilization of Artificial intelligence among Agricultural Education lecturers in Colleges of Education in South East Nigeria

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The study was conducted to determine utilization of artificial intelligence by Agricultural Education lecturers in colleges of education in south East Nigeria. Descriptive survey design was adopted. The population comprised 105 lecturers of Agricultural Education in the colleges of education in the South-East zone of Nigeria. The entire population was used because of its manageable size. Structured questionnaire was used as instrument for data collection. The instrument was validated by three experts, two from the Department of Agricultural Education and one from Measurement and Evaluation. The reliability of the instrument was determined using Cronbach Alpha Reliability with a coefficient of 0.95. Analysis was done using Mean and Standard Deviation while t-test was used to test the hypotheses at 0.05 level of significance. The findings showed a moderate level of awareness; inadequate competence and low utilization use of AI in teaching by lectures. The study recommended among others that there should be adequate provision of artificial intelligence tools in colleges of education for effective teaching and learning of agricultural education contents.

Keywords: *Awareness, Competence, Utilization, Artificial Intelligence, Technology.*

132. Utilizing Artificial Intelligence (AI) in Language Education for Optimal Results in Nigeria

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This paper examines how AI tools such as Natural Language Processing, intelligent tutoring systems, and speech recognition reshape language acquisition in multilingual, resource-constrained environments in Nigeria. It examines the role AI plays in indigenous language revitalization, teacher support, and curriculum enhancement, and highlights such associated challenges as gaps in digital infrastructure, linguistic diversity, and the need for culturally relevant AI models in the country. The paper asserts that in an era characterized by global strive to close educational and technological gaps, the integration of AI in language education in Nigeria offers transformative pathways for rethinking and realigning teacher education for optimal lesson delivery. It advocates for a context-aware approach that empowers teachers with AI-based pedagogical tools adaptable to local needs. It concludes that with strategic policies and investment in local AI development by stakeholders, language education in Nigeria can significantly improve to reflect and preserve its vast linguistic heritage.

Keywords: *Artificial Intelligence, Language Education, Teacher Training, Indigenous Languages, Nigeria.*

Digital Pedagogy and Teaching Innovation

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Digital, blended and online teaching and learning, and innovative approaches to instructional design.

133. A Correlational Study of Digital Infrastructure and Physics Learning Outcomes in Selected Higher Education Institutions in Plateau State, Nigeria

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This study will examine the relationship between digital infrastructure and physics learning outcomes in selected higher education institutions in Plateau State, Nigeria. Specifically, it will assess the availability and accessibility of digital infrastructure and determine its correlational and predictive influence on students' learning outcomes in physics. A correlational survey research design will be adopted, targeting undergraduate physics students in selected institutions through a multistage sampling technique. A sample of 300–400 participants will be selected for the study. Data will be collected using the researcher-developed Digital Infrastructure and Physics Learning Outcomes Questionnaire (DIPLOQ). The instrument will measure digital infrastructure dimensions, including internet access, learning management systems, smart classrooms, virtual laboratories, simulation software, and digital libraries. Physics learning outcomes will be assessed through indicators such as student motivation, academic engagement, academic achievement, practical skills acquisition, and research competence. The instrument will be validated by experts, and its reliability will be established using Cronbach's alpha coefficient, with a minimum acceptable threshold of 0.70. Data will be analyzed using mean and standard deviation to answer the research questions, Pearson Product Moment Correlation to determine relationships among variables, and multiple regression analysis to assess the predictive influence and relative contributions of digital infrastructure components to physics learning outcomes. The study is expected to provide empirical evidence on the role of digital infrastructure in enhancing physics education and inform policies and institutional practices aimed at improving learning outcomes and reducing the digital divide in higher education institutions.

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134. Abstract The persistent digital divide in Nigerian higher education continues to hinder effective chemistry teaching and learning, particularly in laboratory-based instruction where access...

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The persistent digital divide in Nigerian higher education continues to hinder effective chemistry teaching and learning, particularly in laboratory-based instruction where access to adequate facilities, equipment, and safety resources remains limited. These constraints reduce students' opportunities for meaningful practical engagement and weaken their conceptual understanding of chemical principles. In response, this study examines the potential of virtual laboratories and artificial intelligence (AI)-supported learning tools in bridging the digital divide and enhancing chemistry education in Nigerian higher education institutions. The study adopts a mixed-methods research design, incorporating a quasi-experimental approach and a descriptive survey method. The quasi-experimental component compares the academic achievement, conceptual understanding, and laboratory competence of students exposed to virtual laboratory simulations and AI-assisted instruction with those taught through conventional laboratory methods. The survey component explores the perceptions of chemistry lecturers and students regarding the accessibility, usability, and readiness for integrating digital chemistry learning tools. The study focuses on selected universities and colleges of education in Nigeria. Findings are expected to show that students exposed to virtual laboratories and AI-supported instruction achieve higher academic performance, improved practical skills, and greater engagement than those in traditional learning environments. The study also anticipates identifying key barriers such as inadequate ICT infrastructure, limited digital literacy, high cost of technology adoption, and institutional resistance to change. The study concludes that virtual laboratories and AI-based instructional approaches offer significant potential for reducing inequities in chemistry education and promoting a more inclusive, future-ready higher education ecosystem in Nigeria. It recommends sustained investment in digital infrastructure, continuous professional development for lecturers, and the integration of emerging technologies into chemistry curricula.

135. Academia Entrepreneurship in Transforming Life of Arabic Educators in Nigeria

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This paper examines the concept of academic entrepreneurship in transforming life of Arabic educators in Nigeria. In recent years, the increasing demand for innovation in education has necessitated a shift from traditional teaching roles to more entrepreneurial and income-generating academic engagements. In spite of their intellectual contributions, many Arabic educators in Nigeria continue to face challenges such as unemployment, low income, limited institutional support and inadequate integration into modern entrepreneurial and digital education systems. The paper highlights how academic entrepreneurship through activities such as curriculum innovation, digital content development, translation services, Islamic publishing, private tutoring enterprises and online Arabic education platforms can serve as a viable pathway for empowerment and self-reliance. The paper argues that Arabic educators possess valuable linguistic, cultural and religious knowledge that can be transformed into economic opportunities when effectively harnessed. The paper further looks at the role of Islamic organizations, government agencies and educational institutions in supporting entrepreneurial initiatives among Arabic educators through funding, training and policy reforms. It concludes that academic entrepreneurship not only enhances the livelihoods of Arabic educators but also contributes to national development through job creation, knowledge dissemination, and cultural preservation. The paper recommends the integration of entrepreneurship education into Arabic studies curricula and the strengthening of institutional frameworks that promote innovation and sustainability in Arabic education in Nigeria.

136. Adoption and Effectiveness of Blended Learning Management Systems in Public Colleges of Education in Anambra State

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This study investigates the adoption and effectiveness of blended learning management systems (LMS) in public colleges of Education in Anambra state, Nigeria. With the increasing demand for flexible and technology driven instructional methods, blended learning strategies has emerged as a viable approach to enhance teaching and learning outcomes. The research employed a survey research design, with the use of a structured questionnaire to elicit information from population of 1,423 lecturers in the two public Colleges of Education domiciled in Anambra state. The data obtained were analyzed using mean and standard deviation on a four point Likert scale, while the null hypothesis was tested using T-test. From the findings it was observed that while awareness and usage of LMS platforms such as ZOOM, Google classroom, Blackboard are growing with average mean acceptance value of 3.87 and also the government at various levels are making commendable efforts towards trainings and orientation of educators on the use and application of the LMS platforms, however adoption and integration of the modern technology is limited due to several challenges which include infrastructural limitations, poor internet connectivity and access, inadequate funding. Nevertheless, respondents reported improved student engagement, adequate technical knowhow, improved collaboration and higher academic achievement when LMS were adequately integrated with a grand mean of 3.38. The study concluded that blended learning systems hold significant potential for transforming higher education in Anambra state and improving student participation and academic achievement. The study recommended targeted capacity building programs, improved ICT infrastructure and financial support for lecturers and students to sustain blended learning strategies in Nigeria.

137. Adoption of Digital Tools in Teaching Social Studies in Colleges of Education in Nigeria in the Period of Insecurity

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Social studies education is a tool for influencing the individuals positively so that they become useful to themselves and the society. The teaching of social studies offers the unique opportunity to contribute to the transformation of societies through inculcating the norms, culture, values and production of rational citizens. Insecurity harmed academic calendar which led to high rate of social vices in Nigeria such as kidnapping, drop-out, armed robbery, drug abuse etc. Recent advancement in Al-driven educational technologies have introduced innovative instructional approaches, including adaptive online learning system, visualization tools, audio tools, face-book teaching. The study examine benefits of digital tools such as learning + skills, enhanced visualization, access to opportunity and speed +

efficiency, lower cost among others. The study highlights challenges affecting digital tools adoption in Nigerian colleges of education, including epileptic power supply, inadequate digital tools, poor network connection, inappropriate funding. The paper suggests that social studies education can be taught effectively in period of insecurity in Nigeria using digital tools like Whatsapp, telegram, Google classroom, visual tours, zoom and among others.

138. Advancing Learner-Centered Pedagogies Through Digital Innovation

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The rapid development of digital technologies is changing educational practices worldwide and creating new opportunities to implement learner-centred pedagogies. Learner-centred teaching emphasises active participation, collaboration, critical thinking, problem-solving, and personalised learning. Digital innovation enhances these methods by offering flexible learning environments, interactive content, real-time feedback, and broader access to educational resources. This paper investigates the role of digital innovation in fostering learner-centred pedagogies. The study employed a descriptive approach, drawing on a thorough review of existing literature on educational technology, learner-centred instruction, and digital transformation in education. The study demonstrates that digital innovations such as learning management systems, virtual classrooms, mobile learning applications, artificial intelligence and collaborative technologies have the potential to boost learner engagement and academic performance. This study provides practical recommendations for institution authorities, policymakers, and educators to support the effective implementation of learner-centred digital learning environments and existing trends.

139. Advancing Learner-Centered Pedagogy in Senior Secondary Biology through Digital Innovation

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Learner-centered pedagogy has become central to 21st century education, yet many Senior Secondary Biology classrooms in Nigeria still rely on teacher-dominated methods. Digital innovation offers tools to shift focus to the learner. This study is currently investigating the extent to which digital innovation advances learner-centered pedagogy in Senior Secondary Biology. The level of awareness and utilization of digital tools in Biology classrooms students' engagement, challenges affecting their effective use, and possible strategies for improving technology-supported instruction. A descriptive survey design, will be adapted for this study, data will be collected from 200 SS2 Biology students and 20 teachers across 10 schools in Suleja Local Government Area of Niger State through a structured questionnaire Preliminary analysis is being conducted using descriptive statistical tools such as frequency counts, percentages, mean scores, and standard deviations. Early indications suggest that digital innovations including virtual laboratory simulations, multimedia resources, educational applications, and online learning platforms may enhance students' participation, collaboration, critical thinking, and conceptual understanding in Biology. At the same time, emerging observations point to persistent challenges such as inadequate technological infrastructure, limited access to digital devices, unstable internet connectivity, and insufficient teacher training in the use of educational technologies. The study, still in progress, is expected to contribute to understanding how digital innovation can strengthen learner-centered pedagogy in Biology education. It also aims to provide evidence-based recommendations for improving the integration of digital tools in senior secondary schools.

Keywords: *Learner-centered pedagogy, Digital-innovation, Biology education,*

140. Advancing Learner-Centered pedagogy through Digital Innovation

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The rise of digital technology has changed the way teaching and learning happen in schools and universities. More educators now agree that students learn better when they are active participants in the learning process rather than passive recipients of information. However, there is still limited understanding of how digital tools can be used in practical, everyday classroom settings to support this kind of teaching. This study seeks to find out how digital innovation can help teachers put students at the center of learning across different educational environments. The study will use a mixed-methods design, combining questionnaires given to students and teachers in selected higher institutions with interviews and classroom observations. Numbers gathered from the surveys will be analyzed using

basic statistical tools, while responses from interviews will be grouped into themes to identify patterns and meanings. The study is guided by two key ideas: Vygotsky's view that learners grow through interaction and support, and the Technology Acceptance Model, which explains how people decide to use or avoid new technology. The study expects to find out what helps and what gets in the way when teachers try to use digital tools to make learning more student-focused. These barriers and enablers may include teacher skills, available facilities, how engaged students are, and whether all students have fair access to devices and the internet. The results will offer clear, practical suggestions for teachers, school administrators, and education policymakers. This research will add useful knowledge to ongoing conversations about improving teaching and learning through technology.

Keywords: *Digital innovation, learner-centered pedagogy, student engagement, technology integration, technology-enhanced learning. OPATADE Nurudeen Adetunji,*

141. Advancing Learner-Centred Pedagogies Through Digital Innovation in Higher Education: Evidence From Jigawa State, Nigeria

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The rapid integration of digital technologies into higher education is reshaping pedagogical paradigms globally, with growing implications for student engagement, learning outcomes, and institutional effectiveness. In Nigeria, the increasing demand for inclusive, quality education has intensified the urgency of adopting learner-centred approaches anchored in digital innovation. This study examines the role of digital innovation in advancing learner-centred pedagogies within tertiary institutions in Jigawa State, Nigeria. Specifically, it investigates the extent of digital tool integration into teaching and learning, assesses its impact on student participation and academic outcomes, and identifies institutional and contextual challenges constraining effective adoption. The study employs a mixed-methods research design, drawing participants from academic staff and students across selected tertiary institutions in Jigawa State. Data are collected through structured questionnaires, semi-structured interviews, and classroom observations, and analysed using both descriptive and inferential statistical techniques alongside thematic analysis. The theoretical framework is grounded in constructivist learning theory, which foregrounds active student participation and knowledge construction through meaningful, experience-based learning. Findings are expected to demonstrate that digital innovations, including learning management systems, virtual classrooms, mobile learning applications, AI-supported tools, and collaborative online platforms, hold considerable potential for promoting learner autonomy, personalised learning, and improved academic performance. Equally, the study anticipates identifying significant constraints, including inadequate digital infrastructure, limited technological competency among educators, inconsistent internet connectivity, and insufficient institutional policy support. The study contributes empirical evidence from a developing-country context to the broader discourse on digital transformation in higher education, offering practical recommendations for policymakers, administrators, and educators on leveraging technology to strengthen learner-centred practices. Its findings are positioned to inform sustainable, equitable, and technology-driven higher education reform across Nigeria and comparable African contexts.

Keywords: *digital pedagogy, learner-centred learning, digital innovation, higher education, artificial intelligence, educational technology, Jigawa State, Nigeria*

142. Advancing Learner-centred Pedagogy in Literature Teaching Through Digital Innovation

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The paper explores how learner-centred pedagogy in literature teaching can be advanced through digital innovation in contemporary higher education. In many literary studies classrooms, teaching remains largely teacher-centred, with emphasis on textual explication and passive reception of meaning. However, the emergence of digital technologies offers new possibilities for transforming literature instruction into an interactive, participatory and student-driven process. Using constructivist learning theory and reader-response theory, this study argues that digital tools such as e-learning platforms, multimedia resources, digital annotation applications and online discussion forums can enhance student's interpretative engagement with literary texts. These technologies encourage collaborative meaning-making, critical thinking and deeper textual analysis by positioning learners as active participants in the construction of literary meaning. The paper further identifies key challenges, including limited digital literacy, infrastructural constraints and resistance to pedagogical change among instructors. It concludes that effective integration of digital

pedagogy in literature teaching requires curriculum redesign, sustained teacher professional development and institutional support to achieve meaningful learning outcomes.

Keywords: *learner-centred, pedagogy, digital innovation, literature teaching.*

143. Advancing Learner-Centred Pedagogy through Digital Innovation in Nigerian Colleges of Education: A Critical Structured Review

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This paper reviews how digital innovation can advance learner-centred pedagogy in Nigerian Colleges of Education through a critical structured narrative review of the literature. The review synthesizes evidence from 22 international and Nigerian empirical studies, conceptual papers, review articles, and policy documents from goggle scholars, Web of Science, and Scopus to review the pedagogical value of digital technologies, enabling conditions for implementation, equity challenges, and implications for teacher education. The findings indicate that digital innovation enhances learner-centred pedagogy when technology is used to transform teaching and learning through inquiry-based learning, collaboration, formative assessment, authentic knowledge creation, reflective practice, and learner autonomy, rather than merely digitizing traditional lecture methods. Although Nigerian Colleges of Education have demonstrated increasing interest in digital pedagogies and emerging institutional capacity, persistent challenges including inadequate electricity supply, poor internet connectivity, high device and data costs, insufficient staff development, limited institutional support, and unequal access among learners continue to constrain effective implementation. The review further reveals that existing empirical evidence from Nigerian Colleges of Education remains limited in geographical coverage and is dominated by cross-sectional self-report studies, highlighting the need for more rigorous longitudinal and intervention-based research. Based on the synthesis, the study proposes the PADDIFE design heuristic, which integrates pedagogical purpose, access, doing, dialogue, inclusion, feedback, and evidence to guide effective digital learning design. The paper concludes that successful digital transformation in teacher education should be evaluated primarily by its impact on student teachers' agency, learning outcomes, and pedagogical competence rather than by the quantity of digital platforms or technological infrastructure available.

144. Advancing learner-centred pedagogy through Digital innovation: An Evaluation of Adult literacy programme in Bauchi local Government Area, Bauchi State Nigeria

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This study evaluated how digital innovation supports learner-centred pedagogies in adult literacy programmes in Bauchi Local Government Area, Nigeria. While adult literacy is essential for personal, social, and economic empowerment, many programmes still depend on traditional methods that limit learner engagement. Digital technologies offer opportunities to foster collaboration, critical thinking, and self-directed learning. A descriptive survey design was used, involving adult learners, facilitators, and coordinators from selected literacy centres. Data were gathered through questionnaires and interviews, and then analyzed using descriptive statistics. Findings showed that digital tools such as mobile phones, online resources, and multimedia enhance participation, motivation, and retention. Learner-centred approaches further improve engagement and literacy acquisition. However, challenges such as poor infrastructure, limited device access, inadequate facilitator training, unreliable electricity, and insufficient funding hinder effective implementation. The study concludes that digital integration can transform adult literacy instruction. It recommends investing in digital infrastructure, continuous facilitator training, affordable learning tools, and supportive policies to improve literacy outcomes and promote lifelong learning in Bauchi State and beyond.

Keywords: *Adult Literacy, Learner-Centred Pedagogy, Digital Innovation, Adult Education, Lifelong Learning.*

145. Advancing Learners - Centered Pedagogies in Technical Education through Digital Innovations in Colleges of Education in North -West, Nigeria

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Prepared for presentation at the International Conference on Digital Innovations and Higher Education [ICDIHE 2026] University of Kigali, Rwanda, 23–27 November 2026 Conference Theme: Digital Innovations and Higher Education

Abstract This empirical study examined the effect of digital innovations on the advancement of learner-centered pedagogies in teaching Technical Education courses in Colleges of Education in Kaduna State, Nigeria. The main objective was to determine the extent to which digital innovations facilitate learner-centered instruction and to assess their influence on students' practical skill acquisition and engagement. Three research questions guided the study. A quasi-experimental, mixed-methods design was adopted. Data were collected from 180 NCE Technical Education students and 30 lecturers selected through stratified random sampling across three Colleges of Education. Instruments included a Technical Skills Acquisition Test, Student Engagement Questionnaire, Classroom Observation Checklist, and semi-structured lecturer interviews. Quantitative data were analyzed using descriptive statistics, independent _t_ test, and ANCOVA at the .05 level of significance, while qualitative data were thematically analyzed using NVivo 14. Results indicated moderate adoption of digital innovations such as simulations, e-learning platforms, and mobile learning tools to support learner-centered instruction. Testing of the hypothesis revealed a significant difference in practical skill acquisition between groups after controlling for pre-test scores, _F_ (1, 177) = 22.31, _p_ < .001, η^2 = .11. Students exposed to digital-enhanced learner-centered pedagogy recorded higher adjusted mean scores [_M_ = 38.42, _SD_ = 4.15] than those taught using traditional methods [_M_ = 32.18, _SD_ = 5.03]. Key challenges included inadequate ICT infrastructure, limited digital literacy among lecturers, and inconsistent power supply. The study concludes that digital innovations significantly enhance learner-centered pedagogies and improve skill outcomes in Technical Education when supported by institutional investment and capacity building.

Keywords: *learner-centered pedagogy, technical education, digital innovation, skill acquisition, TVET*

146. AI and Digital Technological devices: Building resilience for Teacher Education in Nigeria

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The era of Artificial Intelligence (AI) and digital technological devices has restructured global education systems thereby influencing teaching, learning and assessment practices. Teacher education in Nigeria has continues to face challenges such as inadequate instructional resources, low digital literacy among educators, poor infrastructure and changing pedagogical demands. This paper examines how AI and digital technological devices can build resilience in teacher education in Nigeria by improving adaptability, instructional quality and professional development. The study adopts a conceptual and analytical approach, drawing from current literature on educational technology and AI integration in education. It explores the use of AI-driven tools such as intelligent tutoring systems, adaptive learning platforms, automated assessment systems and virtual learning environments in supporting teacher training and instructional delivery. The role of digital devices such as smartphones, tablets, interactive whiteboards and cloud-based applications in enhancing access to learning materials and promoting collaborative learning were highlighted. Findings revealed that AI and digital technologies strengthen resilience in teacher education by supporting personalized learning, continuous professional development, data-driven instruction and improved classroom management. However, challenges such as high cost of technology, inadequate infrastructure, limited policy implementation and insufficient teacher training hinder its adoption. The paper concludes that integrating AI and digital technological devices into teacher education in Nigeria is essential for producing technologically competent and adaptable educators. The paper recommends increased investment in digital infrastructure, curriculum reforms, capacity-building for teacher educators and strong policy support to ensure sustainable integration of AI in teacher education.

147. Application of Blended Learning in Teaching of Integrated Science

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The increasing integration of digital technologies into education has necessitated the adoption of innovative instructional approaches that enhance teaching effectiveness and improve student learning outcomes. Blended learning, which combines traditional face-to-face instruction with online and technology-mediated learning experiences, has emerged as a promising pedagogical approach for science education. This paper examines the application of blended learning in the teaching of Integrated Science and its potential to enhance students' academic achievement, engagement, and scientific inquiry skills. Integrated Science encompasses concepts from biology, chemistry, physics, and environmental science, requiring instructional strategies that promote active participation, collaboration, and practical understanding. Through blended learning, teachers can utilize digital tools such as

learning management systems, multimedia resources, virtual laboratories, educational videos, online assessments, and collaborative learning platforms to complement classroom instruction. This approach provides students with flexible learning opportunities, facilitates self-paced study, and supports differentiated instruction that addresses diverse learning needs. The paper discusses various blended learning models applicable to Integrated Science education, including the flipped classroom model, rotational learning model, and enriched virtual learning model. It further highlights the benefits of blended learning in improving conceptual understanding, fostering critical thinking, encouraging learner autonomy, and enhancing access to educational resources. Particular attention is given to the relevance of blended learning in resource-constrained educational environments where access to laboratory facilities and instructional materials may be limited. Despite its advantages, challenges such as inadequate technological infrastructure, limited digital literacy among teachers and students, poor internet connectivity, and insufficient institutional support hinders effective implementation. The paper concludes that successful

148. Application of Digital Facilities in Teaching and Learning English Language in Secondary Schools in Potiskum Local Government Area

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This research work investigated the challenges and constraints of applying digital facilities in teaching and learning English language in public secondary schools in Yobe state. The crux of this study was to fine out to what extent teachers and students are given opportunity to use digital facilities for teaching and learning English language at secondary school level. Seventy five (75) respondents constituted the sample for this study: twenty five (25) English Language and Literature teachers and fifty (50) students. Two different sets of questionnaires for teachers and students were constructed as an instrument for the data collection, and Mean scores and standard deviation were used in analysing/describing the data collected for the research. The study emphasised that teachers and students should be aware that digital facilities have now made the tedious work of teaching and learning to be motivative, interesting, simple, educative and time saving. It was found out that, despite the numerous advantages of digital facilities in teaching and learning generally, the traditional “face to face/talk and chalk” method is still prevailing in the public schools. Public schools lack internet facilities as such, this research work advocates that the government should intensify efforts in the provision of internet facilities in the secondary schools. Teachers should shift from traditional method and embrace modern method(s) of teaching English language so as to be able to meet the challenges of the twenty first (21st) centuries.

149. Archives to Classroom: Reimagining History Education with Digital Tools and AI in Nigerian Higher Education

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The traditional approach to teaching History in Nigerian higher education, heavily reliant on textbooks and lecture-based delivery, has increasingly become disconnected from the digital realities of 21st-century learners. This study explores the transformative potential of integrating digital tools and Artificial Intelligence (AI) to reimagine History education. The paper examines how digital archives, virtual museum tours, 3D reconstructions of historical sites such as the Nok, Ife and Benin legacies, and AI-powered inquiry tools can bridge the long-standing gap between archival research and classroom pedagogy. Drawing on experiential learning theory and constructivist pedagogy, the study uses a qualitative desktop and conceptual review methodology to analyse successful global models of digital history pedagogy and their adaptability to the Nigerian context. Findings show that integrating of these tools enhances student engagement, critical thinking, source analysis, and historical empathy, while making abstract historical concepts tangible and immersive. It also democratizes access to primary sources previously confined to distant physical archives. The paper argues that reimagining history through digital innovation is not about replacing the historian, but about equipping educators with new lenses to make the past relevant. It concludes with practical recommendations for Colleges of Education and Universities on curriculum redesign, digital literacy for history educators, and institutional investment in low-cost digital resources to sustain this pedagogical shift.

Keywords: *History Education, Digital Pedagogy, Digital Archives, Virtual Museums, Artificial Intelligence, Nigerian Higher Education*

150. Artificial Intelligence (Ai)-Based Pedagogy and Student Engagement in Nigerian Music Education

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In Nigeria, students continue to grapple with limited access to modern technology and outdated curricula, leaving them disengaged and ill-equipped for an increasingly digitised global music industry. This paper introduces Artificial Intelligence (AI)-based pedagogy as an emerging, distinct learner-centred approach capable of enhancing student engagement in music education. Unlike earlier digital pedagogies, AI-based pedagogy establishes a generative, dialogic relationship where students are active co-creators and critical evaluators, fostering deeper cognitive, emotional, and behavioural engagement with musical content. The paper further explores how music educators, empowered with AI literacy, can integrate these tools into existing curricula to sustain student motivation and participation without waiting for formal review cycles. Drawing on case study examples, the paper argues that AI-based pedagogy offers Nigerian music students opportunities for self-directed, engaged practice that were previously constrained by limited access or teacher availability. By situating AI-based pedagogy within Nigeria's higher education reform agenda, this paper contributes a conceptual framework for understanding AI as a co-teaching agent for enhancing student engagement in African higher education music contexts.

151. Artificial Intelligence -Assisted Teaching and Learning in Chemistry Education: Enhancing Academic Achievement and Digital Competencies among Undergraduate Students in Nigeria

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This paper examines the role of artificial intelligence-assisted teaching and learning in enhancing academic achievement and digital competencies among undergraduate chemistry students in Nigeria. As higher education increasingly embraces digital transformation, artificial intelligence (AI) offers innovative opportunities for personalized instruction, adaptive learning, intelligent tutoring, and real-time feedback. The study explores how AI-driven educational tools can improve students understanding of complex chemistry concepts, foster critical thinking, and strengthen digital literacy skills essential for the twenty-first-century workforce. Furthermore, the paper discusses the opportunities, challenges, and implications of integrating AI technologies into chemistry education within Nigerian higher institutions. The findings highlight the potential of AI-assisted learning to promote student engagement, improve learning outcomes, and contribute to the development of future-ready graduates in an evolving digital educational ecosystem.

152. Artificial intelligence And Digital Pedagogy For Bridging The Digital Divide In Higher Education In Northern Nigeria: Strategies For Building Future Ready Colleges

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The rapid advancement of digital technologies is transforming higher education globally. Yet many African Colleges continue to face significant challenges, including infrastructure deficits, limited digital literacy, inadequate funding, and unequal access to technological resources. These challenges have widened the digital divide and constrained the capacity of higher education institutions to prepare graduates for the demands of the Fourth Industrial Revolution. This paper examines the role of Artificial Intelligence (AI) and digital pedagogy in bridging the digital divide and fostering future-ready higher education ecosystems across Africa, particularly Northern Nigeria. Adopting a qualitative review of emerging literature, policy documents, and selected institutional case studies from Northern Nigeria and beyond, this study explores how AI-powered learning systems, adaptive educational technologies, learning analytics, virtual learning environments, and digital content delivery platforms can enhance teaching effectiveness, student engagement, and learning outcomes. The paper further investigates barriers to implementation, including inadequate digital infrastructure, limited faculty competencies, cyber security concerns, ethical issues, and policy gaps. Findings indicate that strategic integration of AI-supported instructional practices, coupled with institutional capacity building, digital infrastructure development, and supportive policy frameworks, can significantly improve educational access, equity, and quality. The study proposes a framework for AI-driven digital transformation in Northern Nigeria higher institutions that emphasizes inclusivity, sustainability, innovation, and stakeholder collaboration. The paper concludes

that successful digital transformation in higher education requires coordinated efforts among governments, colleges, industry partners, and development organizations to create resilient and technology-enabled learning ecosystems capable of meeting future workforce demands.

Keywords: *Artificial Intelligence; Digital Pedagogy; Higher Education; Digital Divide; Educational Technology; Africa; Future-Ready Colleges.*

153. Artificial Intelligence and Digital Pedagogy: Advancing Learner-Centered English Language Teaching in Nigerian Colleges of Education

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The growing use of Artificial Intelligence (AI) and digital technologies is reshaping teaching and learning across educational institutions is timely. In English Language Teaching (ELT), these innovations offer new ways of promoting learner participation, independent learning, and improved instructional effectiveness. This paper examines how AI can support digital pedagogy in advancing learner-centered approaches to English language teaching in Nigerian Colleges of Education. It discusses the concept of AI-driven digital pedagogy and highlights its relevance to contemporary language education. The paper also considers the application of tools such as intelligent tutoring systems, speech recognition software, machine translation applications, learning analytics, adaptive learning platforms, and generative AI in language instruction. The study argues that the effective use of these technologies can improve language learning outcomes by providing personalized learning experiences, timely feedback, and increased opportunities for learner engagement. In addition, AI-supported instruction can help prospective teachers develop critical thinking, creativity, digital literacy, and professional competence required in modern classrooms. Despite these prospects, several challenges continue to hinder the adoption of AI in teacher education institutions. These include inadequate technological infrastructure, limited access to digital resources, insufficient training of educators, concerns about data privacy, and ethical issues surrounding the use of AI in education. The paper concludes that the successful integration of AI into English language teaching depends on deliberate efforts by stakeholders to strengthen digital infrastructure, enhance teacher capacity, review existing curricula, and establish clear guidelines for the responsible use of AI technologies. Such measures will enable Colleges of Education in Nigeria to harness the benefits of AI while addressing the challenges associated with its adoption.

Keywords: *Artificial Intelligence, Digital Pedagogy, Learner-Centered Learning, English Language Teaching, Teaching Innovation.*

154. Artificial Intelligence and Emerging Technologies in African Teacher Education: Trends, Challenges, and Prospects

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This empirical study investigates the integration of Artificial Intelligence (AI) and Emerging Technologies (ETs) in teacher education across tertiary institutions in Borno State, Nigeria. With the global shift towards digital learning, African teacher education systems are increasingly challenged to incorporate technological innovations. The study will examine the awareness, accessibility, application, and pedagogical implications of AI and ETs among teacher educators. A survey design will be adopted using structured questionnaires to be administered to 120 lecturers from Borno State University Maiduguri, Ramat Polytechnic Maiduguri and Umar Ibn Ibrahim El-Kanemi College of Education, Science and Technology Bama. The data will be analysed using descriptive and inferential statistics. The findings are expected to reveal moderate awareness but limited utilization of AI tools, mainly due to infrastructural and knowledge gaps. The study recommends enhanced digital literacy programs, curriculum reforms, and institutional support to foster AI integration. Implications for policy and teacher education reform are discussed.

Keywords: *Artificial intelligence, Emergence Technology, Teacher Education, Trends, Challenges*

155. Artificial Intelligence and Future of Language Skills Teaching in Nigeria's ESL Classrooms: Reimagining a Future-Ready Higher Education Ecosystem

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This position paper observes that the accelerating pace of digital transformation is reshaping teaching and learning across higher education globally, necessitating innovative pedagogical approaches that equip learners with competencies for the knowledge economy. In Nigeria's English as Second Language (ESL) context, the teaching of language skills – listening, speaking, reading, and writing – continues to face challenges arising from conventional instructional methods, large class sizes, and limited opportunities for personalized learning. While Artificial Intelligence (AI) is increasingly influencing educational practices worldwide, its potential for transforming language skills instruction in Nigerian higher education remains insufficiently explored. This position paper argues that AI offers a strategic pathway for reimagining language skills teaching within a future-ready higher education ecosystem. The contends that AI-driven technologies like intelligent tutoring systems, speech recognition applications, automated writing feedback tools, adaptive learning platforms, and generative AI systems, can significantly enhance language acquisition by providing personalized instruction, real-time feedback, interactive learning experiences, and greater learner autonomy. Such technologies have the capacity to bridge learning gaps, foster communicative competence, and promote digital literacy among undergraduates. However, the paper acknowledges persistent challenges in form of inadequate digital infrastructure, uneven access to technological resources, limited digital competence among educators, and ethical concerns surrounding AI use in education. Drawing on contemporary scholarship and emerging trends in digital language pedagogy, the paper advocates deliberate policy reforms, curriculum innovation, institutional investment, and continuous professional development for language teachers. It concludes that the effective integration of AI into language skills teaching is crucial for bridging the digital divide and positioning Nigerian higher education institutions to produce globally competitive graduates capable of thriving in an increasingly digital world.

Keywords: *Artificial Intelligence, Language Skills Teaching, ESL, Digital Pedagogy, Higher Education, Nigeria, Future-Ready Education.*

156. Artificial Intelligence and Future-Ready Literary Pedagogy in Africa: Teaching Achebe's Things Fall Apart and Gimba's Sacred Apples in Higher Educatio

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The continuous incorporation of Artificial Intelligence (AI) into higher education has propelled new vistas in terms of groundbreaking research, which translates to teaching and learning across scholarly disciplines. Given the fact that substantial interest has been committed to the use of AI in the science or technology-related disciplines, there exists the challenges regarding underutilisation of its potential to facilitating the teaching of literature in African universities. This paper against this backdrop explores the role of Artificial Intelligence (AI) in facilitating Future-ready Literary Pedagogy through the teaching of Chinua Achebe's Things Fall Apart (1958) and Abubakar Gimba's Sacred Apples (1994). The paper examines how AI-enhanced tools such as "Intelligent Tutoring Systems", "Generative AI Platforms", "Digital Annotation Software", and "Interactive Learning Environments" could propel learners' interrogation of thematisation, characterisation, Cultural Representation and Socio-political Discourse in the selected texts. With the adoption of qualitative research method through the exploratory approach, this paper taps from subsisting scholarly research on the use of AI in literary pedagogy to explore the potential and challenges involved in incorporating AI for pedagogy in African literature classrooms. The paper contends that, although AI can improve personalised learning, facilitate critical reading skills and increase access to literary resources; its unethical usage in academia should be discouraged. The study finds amongst other factors that higher education systems in Africa can be revolutionised not only through the bridging of the digital divide gaps, but also by equipping learners with literary competence and digital literacy. Conclusion here hinges on the fact that the use of AI should be understood as assisted technology rather than it being a substitute for human engagements.

157. Artificial Intelligence and Learner -Centered Pedagogy:A Conceptual Analysis for Colleges of Education in Nigeria

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Colleges of Education in Nigeria play a critical role in preparing future teachers who are expected to function effectively in increasingly digital and technology-driven learning environments. Integration of Artificial Intelligence (AI) into teaching and learning has reshaped educational practices globally, creating new opportunities for innovative, personalized, and learner-centered teaching and learning. However, in Nigeria the use of traditional teacher-centered

instructional approaches has continued to dominate implementation of curriculum especially in higher institutions. This has contributed to unwillingness and limited access to educational technologies and inadequate digital competencies among educators which continue to constrain the development of critical thinking, creativity, collaboration, and problem-solving skills among students. This paper presents a conceptual analysis of the relationship between artificial intelligence and learner-centered pedagogy in Colleges of Education in Nigeria. The analysis argues that AI can serve as a catalyst for scaling learner-centered practices by enabling adaptive learning pathways, automated formative feedback, and data-driven instructional decisions. However, the paper also highlights conceptual and contextual tensions, including risks of algorithmic bias, data privacy concerns, and the potential erosion of human pedagogical interaction. Specific implications for curriculum design, lecturer roles, and institutional readiness in Nigerian Colleges of Education are discussed.

158. Artificial Intelligence Integration as a Catalyst for Educational Innovation and Teaching-Learning Effectiveness in Nigerian Colleges of Education

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This study examined artificial intelligence (AI) integration as a catalyst for educational innovation and teaching-learning effectiveness in Nigerian Colleges of Education. A descriptive survey design was adopted, targeting 14,120 academic staff in 62 Colleges of Education across North-Central Nigeria. A sample of 386 academic staff was drawn using stratified random sampling. Data were collected using a 25-item Artificial Intelligence Integration and Educational Effectiveness Scale (AIIEES) developed by the researcher. The instrument was validated by experts in Educational Technology and Measurement and Evaluation, while its reliability was established through the test-retest technique using Pearson Product Moment Correlation, yielding a reliability coefficient of 0.87. Mean ($\bar{x}$) and standard deviation (SD) were employed for data analysis. Findings revealed a moderate level of AI integration among academic staff in Nigerian Colleges of Education. The results further indicated that AI adoption contributed positively to educational innovation through enhanced lesson preparation, personalized learning experiences, improved assessment practices, increased access to instructional resources, and greater instructional efficiency. However, the extent of AI utilization remained constrained by inadequate digital infrastructure, limited AI competencies among lecturers, insufficient institutional support, and concerns regarding ethical and responsible use of AI technologies. Significant differences were observed between federal and state Colleges of Education in the availability of AI facilities and institutional support mechanisms, with federal institutions demonstrating relatively higher levels of AI integration. Based on the findings, the study recommends that: Government and educational regulatory agencies should provide adequate digital infrastructure and funding for AI-driven initiatives; Colleges of Education should organize continuous professional development programmes to strengthen lecturers' AI competencies; Institutional policies should be developed to guide the ethical and effective use of AI in teaching and learning; and Colleges of Education should establish strategic partnerships with technology providers to promote sustainable AI adoption and educational innovation.

159. Artificial Intelligence Integration in Physics Education: Enhancing Conceptual Understanding and Problem -Solving Skills among Undergraduate Students in Nigeria

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This study presents a review of existing literature on the integration of artificial intelligence (AI) in physics education and its potential to enhance conceptual understanding and problem-solving skills among undergraduate students in Nigeria. Physics, as a core science discipline, is often characterized by abstract and mathematically intensive concepts such as mechanics, electromagnetism, thermodynamics, and quantum physics, which pose significant learning challenges for students. Recent advancements in AI-driven educational technologies have introduced innovative instructional approaches, including adaptive learning systems, intelligent tutoring systems, simulation-based visualization tools, and real-time feedback mechanisms. The review synthesizes scholarly works on the application of AI in physics teaching and learning, with emphasis on its role in improving student engagement, conceptual clarity, and analytical reasoning skills. It further examines reported benefits such as personalized instruction, enhanced visualization of complex phenomena, and improved academic performance. In addition, the study highlights contextual challenges affecting AI adoption in Nigerian higher education, including inadequate digital infrastructure, limited lecturer competence, and funding constraints.

160. Artificial Intelligence Literacy as a Predictor of Digital Pedagogical Readiness among Lecturers in Tertiary Institutions in Gombe State, Nigeria

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The emergence of Artificial Intelligence (AI) is reshaping teaching and learning practices across higher education institutions worldwide. While universities are increasingly embracing AI-driven educational innovations, little is known about the preparedness of lecturers in Colleges of Education, which serve as the primary institutions for teacher preparation in Nigeria. This study investigates the extent to which Artificial Intelligence literacy predicts digital pedagogical readiness among lecturers in Colleges of Education in Nigeria. A correlational survey design will be adopted. The study population comprises lecturers in federal and state Colleges of Education, in North-East, Nigeria. A sample of 450 lecturers will be selected through a multistage sampling procedure. Data will be collected using the Artificial Intelligence Literacy Scale (AILS) and the Digital Pedagogical Readiness Questionnaire (DPRQ). Descriptive statistics will be used to determine lecturers' levels of AI literacy and digital pedagogical readiness, while Pearson Product Moment Correlation and Multiple Regression analyses will test the predictive influence of AI literacy on digital pedagogical readiness. The study is anchored on the Technology Acceptance Model (TAM). Findings are expected to reveal significant relationships between lecturers' AI competencies and their readiness to integrate digital technologies into instructional practices. The study will provide evidence-based recommendations for strengthening AI capacity-building programmes and institutional digital transformation initiatives within Colleges of Education. The findings are expected to contribute to the development of future-ready teacher education institutions capable of preparing teachers for technology-enhanced learning environments.

161. Assessing the Adoption and Effectiveness of Digital Innovation in Colleges of Education in Northwest Nigeria: A Quantitative Analysis

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Digital innovation has become a critical catalyst for educational transformation in higher education institutions worldwide. In Nigeria, Colleges of Education are increasingly integrating digital technologies into teaching, learning, research, and administrative processes to improve educational quality and institutional performance. Despite growing investments in educational technologies, empirical evidence regarding the extent of adoption and effectiveness of digital innovation in Colleges of Education remains limited, particularly in Northwest Nigeria. This study quantitatively assesses the level of adoption and effectiveness of digital innovation in Colleges of Education in Northwest Nigeria. A descriptive survey research design was adopted. The target population comprised academic staff, administrators, and students from selected Colleges of Education across the seven states of Northwest Nigeria. Data were collected using a structured questionnaire and analyzed using descriptive and inferential statistics. Findings indicate a moderate level of digital innovation adoption across institutions, with significant variations in technology utilization, digital competence, and institutional support. The study further reveals a positive relationship between digital innovation adoption and teaching effectiveness, student engagement, and institutional efficiency. Challenges identified include inadequate infrastructure, limited funding, poor internet connectivity, and insufficient professional development opportunities. The study recommends increased investment in digital infrastructure, continuous capacity-building programmes, and the development of comprehensive digital transformation policies to enhance educational outcomes in Colleges of Education.

162. Assessing the Impact of Digital Tools on Laboratory Performance in Chemistry Education Programs: A Nigerian College of Education Perspective

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The integration of digital tools into science education is increasingly promoted as a catalyst for enhanced pedagogical outcomes, yet empirical evidence from developing educational contexts remains scarce. This study assesses the impact of digital tools on laboratory performance within chemistry education programs in Nigerian Colleges of Education. Adopting a mixed-methods sequential explanatory design, the research first quantitatively compared the laboratory

practical scores and skill acquisition levels of two cohorts of pre-service chemistry teachers: one utilizing a blended laboratory approach incorporating simulations and data-logging software, and a control group employing traditional, equipment-only methods. Performance data were supplemented by pre- and post-intervention practical examinations. Subsequently, qualitative data were collected through semi-structured interviews and focus group discussions to explore students' and instructors' perceptions of the digital tools' usability, efficacy, and challenges. Findings reveal a statistically significant improvement in the experimental group's conceptual understanding and data interpretation skills. Thematic analysis of qualitative data highlights critical mediating factors, including inconsistent power supply, limited technical support, and a pronounced pedagogical culture that favors direct instruction over exploratory digital learning. The study concludes that while digital tools offer substantial cognitive benefits for chemistry laboratory education in this context, their transformative potential is contingent upon addressing infrastructural deficits and providing targeted professional development for instructors. These findings have implications for curriculum policy and the sustainable implementation of educational technology in resource-constrained tertiary institutions.

163. Assessment of Information and Communication Technology (ICT) Integration for the Preparation of Future-Ready Social Studies Teachers in Nigerian Colleges of Education

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This study investigated how information and communication technology (ICT) is incorporated into the training of future-ready Social Studies teachers at Nigerian colleges of education using the Federal College of Education (Special), Oyo as a case study. A descriptive survey research design was used in the study. Using simple random sampling technique, a sample of one hundred (100) social studies students was selected. A self-developed structured questionnaire called the ICT Integration for Future-Ready Teacher Preparation Questionnaire (IIFRTPQ) was used to gather data. Experts in Social Studies and Educational Technology validated the instrument, and a pilot study yielded a reliability coefficient of 0.81. Descriptive statistics like frequency counts, percentages, means, and standard deviations were used to analyze the data.

The results showed that ICT resources were moderately accessible and used in social studies teachers training. The study also demonstrated that students' digital literacy, instructional competency, collaborative learning, and preparedness for modern classroom practices were all improved by ICT integration. However, the study revealed that there exist some challenges in effective ICT integration such erratic power supplies, poor internet access, and insufficient of technical support. The study came to the conclusion that while ICT is important in educating Social Studies teachers for the future, better infrastructure and capacity-building programs are required to optimize its advantages.

Increased funding for ICT facilities, frequent training for instructors and students, better internet connectivity, and the creation of institutional policies t6hat support technology-enhanced teacher education at Nigerian colleges of education were all suggested by the study.

Keywords: *Colleges of Education, Future-Ready Teachers, Information and Communication Technology (ICT), Social Studies Education, Teacher Preparation Word count: 248*

164. Assessment of Learner'S Centre Pedagogies through Digital Innovation Technologies in Tertiary Institutions in South West, Nigeria

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The increasing propensity of integration of digital technologies into higher education has revolutionalised teaching and learning, making learner-centred pedagogies more achievable in tertiary institutions.This study investigated the assessment of learner's centre pedagogies through digital innovation technologies in tertiary institutions in South West geopolitical zone of Nigeria. The study adopted a descriptive survey research design. A total of 300 respondents of undergraduate students in Colleges of Education, Polythecnics and Universities were selected using a multistage sampling technique, with respondents drawn from one College of Education, Polytechnic and University from each of the six states. Data were collected using a researcher-developed questionnaire titled Assessment of Learner's Centre Pedagogies Through Digital Innovation in Tertiary Institutions (ALCPTDITI). The instrument was validated by experts in Educational Technology and Measurement and Evaluation, a Cronbach's Alpha coefficient of 0.88 established its reliability. Data were analysed using frequency counts, percentages, mean, Standard Deviation, while the Pearson

Product Moment Correlation Coefficient, and One-Way ANOVA at the 0.05 level of significance which will be used to answer the hypotheses. The findings revealed a high level of adoption of digital innovation across the selected tertiary institutions and a significant positive relationship between learner's centre pedagogies and digital innovation technologies in tertiary institutions. The study also revealed inadequate digital infrastructure, unstable electricity supply, poor internet connectivity, and limited digital competencies as major barriers to effective implementation. The study concludes that digital innovation enhances learner 's centre pedagogies, collaborative learning, self-directed learning, and academic performance. The study further recommends increased investment in digital infrastructure, constant training of learners, affordable internet access for students, and stronger institutional policies supporting learner-centred digital education.

Keywords: *Learner's Centre, Pedagogies, Digital Innovation, Technologies, Tertiary Institutions, and South -West Geopolitical Zone.*

165. Assessment of Teachers Competencies in Digital Pedagogy and Teaching Innovation in Taraba State, Nigeria

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The study investigated level of competences of teachers' in digital pedagogies and teaching innovation in Taraba state Nigeria, It was guided by three hypothesis, the descriptive and interferential survey design was adopted for the study using non-participant obtrusive observation techniques. All the 2, 899 teachers in higher Institutions in Taraba State constituted the population of the study, multistage sampling techniques which includes proportionate and simple random techniques was used to select 375 both male and female teachers in higher institutions as the sample for the study. An instrument developed by the researcher "Assessment of Teachers' Competences, Rating scale in digital pedagogy and teaching innovation" (ATCRSDPTI) with scorer or rater reliability estimate of 0.99 using Kendall's coefficient of concordance was used to collect data. The instrument was validated by experts in measurement and evaluation. Z–test statistics was used to test the null hypothesis at 0.05 level of significance. Findings among others revealed that the level of teachers' competence in advancing learner centered pedagogies through digital innovation in presenting their units of instruction is significantly below the average. Training and re-training for all teachers for the digital pedagogy and teaching innovation were among the recommendations made based on the finding of the study.

Keywords: *Assessment, Teacher's competence, Pedagogy, Digital, innovation.*

166. Assessment of the Impact of Artificial Intelligence in the Implementation of Teacher Education Policy in Selected Federal Colleges of Education in Nigeria

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This paper examines the impact of Artificial Intelligence (AI) on the delivery of teacher education in Nigeria. With the increasing integration of AI technologies in educational systems worldwide, this paper evaluates the roles AI tools and platforms play in the implementation of dual mandate policy in teacher training, and curriculum development in Nigerian Colleges. Using a mixed-methods approach, data were collected through surveys and interviews with faculty, students, and policymakers to assess AI's role in enhancing teaching effectiveness, administrative processes, and educational access. The findings highlight both the opportunities and challenges AI presents in improving policy implementation, including issues related to infrastructure, digital literacy, the adequacy and readiness of the manpower to adapt to current global realities. The study underscores the need for capacity-building initiatives to better harness AI's potential in teacher education, ensuring its sustainable integration into Nigeria's educational system.

167. Attitude and Perception of Colleges of Education Arabic Teachers towards Integrating Technology into Classroom Instruction

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The integration of technology into language instruction has become a cornerstone of modern pedagogy; however, its adoption within traditional Arabic language teacher preparation programs remains underexplored. This empirical

study investigated the attitudes and perceptions of Arabic teachers at Colleges of Education regarding the integration of technology into their classroom instruction. A mixed-methods convergent parallel design was employed. Quantitative data was collected from 162 Arabic teachers across six public Colleges of Education in Nigeria using a validated 28-item Likert-scale questionnaire (α = 0.91), measuring attitudes (affective, behavioral, and cognitive components), perceived usefulness, and perceived barriers. Qualitative data was gathered through semi-structured interviews with 18 purposively selected participants to contextualize statistical findings. Descriptive statistics revealed that 71% of teachers held moderately positive attitudes toward technology, recognizing its potential to enhance Arabic vocabulary acquisition, pronunciation through audio-visual tools, and learner engagement. However, only 34% reported consistent technology integration in their actual teaching. Inferential analysis using Pearson correlation indicated a significant positive relationship between perceived ease of use and frequency of technology adoption ($r = 0.62$, $p < .01$). An independent t-test showed no significant gender-based differences in overall attitudes ($t = 1.34$, $p > .05$). Thematic analysis of interview data identified three major perceived barriers: (1) lack of Arabic-specific digital content aligned with college curricula, (2) insufficient technical infrastructure and support, and (3) deeply rooted pedagogical reliance on grammar-translation methods. Notably, a salient attitude-practice gap emerged, where favorable dispositions did not translate into classroom action, partly due to fears that technology might compromise the linguistic authenticity of classical Arabic instruction. These findings suggest that addressing infrastructural deficits alone is insufficient; targeted, context-sensitive professional development and culturally appropriate digital resource creation are imperative for bridging the gap between positive attitudes and sustained technology integration in Arabic language teacher education. Keywords: Technology integration, Arabic language teaching, teacher attitudes, attitude-practice gaps, Colleges of Education

العربية في كليات التربية تجاه دمج التكنولوجيا في تعليماتهم الصفية. تم استخدام التصميم المتقارب المتوازي ذي المنهجية المختلطة. جمعت البيانات الكمية من ومع ذلك، لا يزال تطبيقه في برامج إعداد معلمي اللغة العربية التقليدية غير مستكشف بدرجة كافية. تناولت هذه الدراسة التجريبية اتجاهات وتصورات معلمي اللغة التربية (التقنية) الفدرالية غسو، ولاية زمفرا، نيجيريا رقم الهاتف: الملخص: أصبح دمج التكنولوجيا في تعليم اللغة ركيزة أساسية من ركائز علم التربية الحديث؛ معلمي اللغة العربية في كليات التربية نحو دمج التكنولوجيا في تعليمات الفصول الدراسية إعداد: الدكتور عيسى بلا هوماوا القسم: قسم اللغة العربية المؤسسة: كلية (ليكرت) وتم التحقق من صحتها ألفا كرونباخ 28 معلما للغة العربية في ست كليات تربوية عامة في نيجيريا باستخدام استبانة مكونة من 162 اتجاهات وتصورات الوجدانية والسلوكية والمعرفية، والفائدة المدركة، والمعوقات المدركة. جمعت البيانات النوعية من خلال مقابلات شبه منظمة مع0.91 = فقرة على مقياس ذلك، أفاد 71% مشاركا تم اختيارهم بأسلوب هادف لتفسير النتائج الإحصائية. أظهرت الإحصاءات الوصفية أن 18 ،) وقد قاست الاستبانة الاتجاهات المكونات إيجابية معتدلة نحو التكنولوجيا، معترفين بقدرتها على تعزيز اكتساب مفردات اللغة العربية، والنطق من خلال الأدوات السمعية-البصرية، وإشراك المتعلمين. ومع الاستدلالي باستخدام ارتباط (بيرسون) إلى وجود علاقة إيجابية كبيرة بين السهولة المدركة للاستخدام وتكرار تبني التكنولوجيا 34% من المعلمين لديهم اتجاهات وجود فروق ذات دلالة إحصائية تعتمد على الجنس في الاتجاهات العامة .($r = 0.62$، $p < .01$) فقط عن دمج ثابت للتكنولوجيا في تدريسهم الفعلي. أشار التحليل والمتوافق مع مناهج الكليات، - (1): حدد التحليل الموضوعي للبيانات النوعية ثلاثة معوقات رئيسية مدركة .($t = 1.34$، $p > .05$) أظهر اختبار ت المستقل عدم اتجاهات المعلمين، فجوات الاتجاه-الممارسة، كليات التربية (3) البنية التحتية التقنية غير الكافية وغياب الدعم، (2) نقص المحتوى الرقمي الخاص باللغة العربية الاعتماد التربوي الراسخ على طرق الترجمة والقواعد. الكلمات المفتاحية :دمج التكنولوجيا، تعليم اللغة العربية،

168. Availability and Utilization of Digital Tools (DT) in Teaching Science in Colleges of Education in Enugu State, Nigeria

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Digital pedagogy is the intentional application of digital tools to support or improve teaching and learning. Digital tools are widely used to complement conventional teaching strategies. They are potent tools for effective teaching in schools. The much emphasis placed on the use of digital tools in teaching and learning calls for a study in Colleges of Education in Enugu State, Nigeria. In the present study the researchers ascertained the availability and the extent educators use digital tools to teach science in colleges of education in Enugu State. Three existing Colleges of Education located in Enugu State were used for the study. A questionnaire developed by the researchers was used to collect data from Science educators in the selected Colleges of Education. Three research questions and three hypotheses were formulated to guide the study. The research questions were answered using percentages, mean and standard deviation (SD), while hypotheses were tested using z-statistics. Findings indicate that digital tools are inadequate and that, most of the time, educators do not use digital tools to teach. Shortages of digital resources, pedagogical mismatch and lack of professional training hinder the use of digital tools by science educators, among other hindering factors. The researchers were of the view that inadequate and lack of utilization of digital tools by educators will render teaching of science ineffective. Similarly, hindering factors will reduce educators' effectiveness. Consequently, the quality of learning will be affected. To address the observed situations, the researchers recommended that the management of educational institutions should equip the Colleges of Education with digital tools and continuously train science educators, especially in digital pedagogy, among other measures.

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Keywords: *Digital tools, availability, utilization, teaching and learning, science*

169. Away from Chalkboard to Cloud: a Historical Policy Analysis of Digital Transformation in Nigerian Higher Education

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This paper examines the historical evolution of digital transformation policies in Nigerian higher education as a lens for bridging Africa's digital divide. While global discourse celebrates cloud computing, AI, and Learning Management Systems, Nigerian public universities still oscillate between chalkboard pedagogy and fragmented digital initiatives. This paradox necessitates a historical policy inquiry. The study employs historical research methodology and policy cycle analysis to interrogate three transformation waves from 2000-2025: (i) the ICT Centre Wave, (ii) the Emergency Remote Learning Wave triggered by COVID-19, and (iii) the current Intelligent Cloud Wave. Data sources include critical analysis of the National Policy on Education, National ICT in Education Policy (2019), NUC E-learning Directives, and UNESCO frameworks, triangulated with oral interviews with senior academics in three Southwest Nigerian universities. Findings indicate that digital policies have been aspirational but ahistorical, donor-driven, and decontextualized. Implementation gaps persist due to infrastructural deficits, policy discontinuity, underfunding, and low digital competence among history and humanities educators, thereby widening the digital divide within and across African higher education systems. It is aimed to propose a historically-informed inclusive transformation framework that aligns policy memory with future readiness. It contributes to ICDIHE 2026's goal of reimagining a future-ready higher education ecosystem that preserves indigenous knowledge while embracing digital innovation.

Keywords: *Digital Transformation, Historical Policy Analysis, Digital Divide, Nigerian Higher Education, Cloud Learning Word Count: 250 words*

170. Beyond the Smartphone: Designing Low-Tech, High-Touch Hubs for Phygital Learning in Offline Rural African Communities

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The prevailing narrative of bridging the digital divide often focuses exclusively on providing devices and connectivity. This research challenges that device-centric model by positing that for the most marginalized rural communities in Africa, the primary barrier is not the device itself, but the lack of a supportive learning ecology. This study proposes and evaluates a "phygital" (physical + digital) hub model: a low-tech, high-touch community learning center that operates primarily offline, syncing only periodically via low-earth-orbit satellite or mobile mesh networks. The abstract outlines a quasi-experimental design comparing student outcomes in three rural villages in Malawi: one with standard internet-enabled tablets, one with no intervention, and one with a phygital hub. The hub features curated, pre-loaded digital content on solar-powered servers, accessed via simple devices, and crucially, a trained facilitator who provides high-touch human mediation. The research argues that "future-ready" cannot be synonymous with "always online." Instead, it reimagines the ecosystem as a resilient, hybrid space where high-quality digital resources are married to essential human interaction and mentorship. Findings anticipate that the phygital model will reduce the "digital dropout" caused by infrequent connectivity and technical frustration. This work redefines access not as the presence of a signal, but as the sustainable rhythm of knowledge transfer between the digital and the human world.

171. Beyond the Traditional Workshop: Transforming Woodwork Technology Education through Digital Pedagogy and Emerging Technologies

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The rapid advancement of digital technologies is transforming technical and vocational education, creating the need to rethink traditional workshop-based instructional practices. Woodwork Technology Education, which has traditionally relied on conventional tools, equipment and practical demonstrations, must adapt to emerging technologies to adequately prepare learners for contemporary industrial and workplace demands. This paper examines the transformation of Woodwork Technology Education beyond the traditional workshop through the integration of digital pedagogy and emerging technologies. Specifically, it explores the potential applications of Computer Numerical

Control (CNC) machines, computer-aided design (CAD), digital fabrication, simulation technologies and other technology-supported instructional approaches in enhancing teaching, learning and practical skill acquisition. The paper also considers the implications of these innovations for lecturers' professional development, workshop management, curriculum delivery and graduate employability. It highlights challenges associated with inadequate infrastructure, limited funding, insufficient digital competencies and institutional readiness. The paper argues that integrating digital pedagogy with conventional workshop practices can improve instructional effectiveness, promote creativity and innovation, and strengthen learners' preparedness for the changing world of work. It recommends investment in digital workshop infrastructure, continuous professional development for lecturers, curriculum modernisation and stronger collaboration between educational institutions and industry.

Keywords: *Woodwork Technology Education, Digital Pedagogy, Emerging Technologies, Digital Fabrication, CNC Technology, Workshop Transformation*

172. Bridging the Digital Divide and Promoting Inclusion, Equity and Access for All

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The persistent digital divide in Nigeria remains a critical impediment to inclusive development, equitable access, and socioeconomic transformation. This study investigates the determinants of digital inclusion in Nigeria over the period 1990–2024, with specific focus on ICT infrastructure development, digital literacy, and income inequality as key explanatory variables. Employing the Autoregressive Distributed Lag (ARDL) bounds testing approach, the study establishes both short-run dynamics and long-run equilibrium relationships among the variables. Diagnostic tests for serial correlation, heteroscedasticity, functional form misspecification, and parameter stability are conducted to validate the robustness of the estimated models. Findings reveal that ICT infrastructure development and digital literacy exert significant positive long-run effects on digital inclusion, while income inequality exerts a significant negative effect, confirming that distributional disparities remain a structural barrier to equitable digital access in Nigeria. The study concludes that bridging Nigeria's digital divide requires coordinated policy interventions targeting rural infrastructure expansion, digital skills development, and income redistribution mechanisms. These findings carry important implications for Nigeria's National Broadband Plan and broader Sustainable Development Goal 9 and 10 targets on innovation infrastructure and reduced inequalities.

173. Bridging the Digital Divide in Mathematics Education: Reimagining Technology - Enhanced Learning for Future - Ready African Universities

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The digital divide remains a significant challenge to effective mathematics education in many African Universities. Limited access to Technology, Internet connectivity and Digital skills continues to hinder quality learning outcomes. This paper explores how technology- enhanced learning can transform Mathematics education and prepare students for a rapidly evolving digital world. It examines the use of digital tools such as learning management systems, virtual classroom, mobile applications, and artificial intelligence in improving teaching and learning. The paper also identifies barriers to implementation, including inadequate infrastructure and insufficient digital literacy among educators and students. Emphasis is placed on the need for inclusive politics, curriculum innovation and capacity building. The study advocates collaborative efforts among governments, institution and stakeholders to promote digital inclusion. It argues that technology integration can enhance mathematical understanding, engagement and problem-solving skills. Bridging the digital divide is essential for equitable access to quality mathematics education. Ultimately, future-ready African Universities must leverage digital technologies to strengthen learning outcomes and support sustainable development.

174. Bridging the Digital Divide through Inclusive Blended Learning: Assessing the Influence of Digital Pedagogy and Teaching Innovation on Student Engagement and Future-Ready Competencies in...

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The persistent digital divide in African higher education continues to limit equitable access to technology-supported learning, particularly among students in institutions with inadequate digital infrastructure, limited internet connectivity, and uneven levels of digital competence. This study examines how inclusive blended learning can help bridge this divide by assessing the influence of digital pedagogy and teaching innovation on student engagement and future-ready competencies in Nigerian universities. Specifically, it investigates the extent to which accessible digital platforms, flexible learning approaches, interactive online content, collaborative technologies, and lecturers' digital teaching practices enhance students' participation, motivation, digital literacy, communication, critical thinking, and problem-solving abilities. The study adopts a mixed-methods research design involving students and lecturers selected from Nigerian universities. Quantitative data were collected through structured questionnaires, while qualitative data were obtained through interviews with lecturers and institutional stakeholders. The quantitative data was analyzed using descriptive statistics and appropriate inferential techniques, whereas the qualitative evidence was analyzed thematically. The study is expected to reveal the digital, pedagogical, and institutional conditions under which blended learning promotes meaningful student engagement and the development of competencies required for employment, lifelong learning, and participation in a digitally driven economy. The study will contribute to ongoing discussions on reimagining future-ready higher education ecosystems in Africa by providing evidence-based recommendations for inclusive digital pedagogy, lecturer capacity development, institutional investment, and equitable access to blended and online learning. Its findings will be relevant to university administrators, educators, and policymakers seeking to transform digital access into effective, inclusive, and sustainable learning outcomes.

175. Bridging the Digital Divide: Assessing the Influence of Technological Pedagogical Approaches on Instructional Delivery in Business Education Programs in Nigeria

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The rapid digitization of global economies necessitates a parallel evolution in educational practices, particularly within Business Education programs tasked with producing future-ready professionals. However, in developing nations like Nigeria, a persistent digital divide, characterized by disparities in access, skills, and usage, critically impedes the effective integration of technology into instructional delivery. This study assesses the influence of various Technological Pedagogical Approaches on instructional delivery within Business Education programs in selected tertiary institutions in Northeastern Nigeria. Employing a mixed-methods research design, the study gathered quantitative data from 100 Business Education lecturers and students across selected federal and state Colleges of Education, complemented by qualitative interviews with 5 Heads of Department. The findings reveal a significant positive correlation between the adoption of specific Technological Pedagogical Approaches such as blended learning, simulation-based instruction, and cloud-collaborative tools and enhanced student engagement, practical skill acquisition, and overall instructional effectiveness. Conversely, the study identifies critical moderating barriers, including inadequate digital infrastructure, erratic power supply, high data costs, and insufficient continuous professional development. The research underscores that technology alone is insufficient; its pedagogical integration must be contextualized to overcome systemic infrastructural and socio-economic challenges. The paper concludes by proposing a strategic framework for sustainable Technological Pedagogical Approaches implementation, emphasizing policy-driven investment in infrastructure, the development of localized digital content, and the establishment of continuous capacity-building initiatives for educators. This study contributes vital empirical evidence to the discourse on digital transformation in education, offering actionable insights for policymakers, educational administrators, and curriculum developers aiming to bridge the digital divide and foster a resilient, technologically adept workforce in Nigeria.

176. Bridging the digital divide: Reimaging future - Ready Higher Education Ecosystems in Africa

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The advancement of digital technologies has transformed educational practices, creating new opportunities for innovative and learner-centered approaches to mathematics education. Digital pedagogy integrates technological tools, digital resources, and interactive learning environments to enhance teaching effectiveness and improve students' engagement. This paper examines how digital innovation supports learner-centered pedagogies in mathematics by promoting active participation, collaboration, critical thinking, and personalized learning experiences.

Through the use of technologies such as learning management systems, virtual manipulatives, educational applications, and online assessment platforms, learners can explore mathematical concepts in more meaningful ways and interactive ways. Digital tools also enable teachers to differentiate instruction, provide immediate feedback, and monitor students' progress effectively. The study highlights the role of digital pedagogy in shifting mathematics instruction from traditional teacher-centered methods approaches that empower learners to construct knowledge, solve real- world problems, and develop higher-order thinking skills. Additionally, it discusses challenges associated with technology integration, including digital literacy gaps, infrastructure limitations, and equitable access to digital resources. The paper concludes that the successful implementation of digital pedagogy requires continuous teacher professional development, supportive educational policies, and strategic investment in technological infrastructure. By leveraging digital innovations, educators can create inclusive, engaging, and adaptive mathematics learning environments that enhance students' achievement and prepare learners for the demands of the digital age.

177. Bridging the Digital Gap in Anglophone West African Literary Studies: Access, Archives, and Pedagogy

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The digitalization has transformed the production, dissemination, and consumption of knowledge across disciplines. However, significant disparities in technological access continue to shape educational experiences in many developing regions, particularly in Anglophone West Africa. Within the field of Literary Studies, digital technologies have opened new possibilities for research, archiving, teaching, and scholarly collaboration. Yet, many higher institutions in countries such as Nigeria, Ghana, Sierra Leone, Liberia, and The Gambia continue to grapple with infrastructural deficiencies, inadequate digital literacy, limited access to electronic resources, and insufficient digital preservation initiatives. This paper examines the digital gap in Anglophone West African Literary Studies through the interconnected lenses of access, archives, and pedagogy. Drawing upon Digital Humanities scholarship, the study explores how digital technologies can democratize literary knowledge, preserve African literary heritage, and enhance innovative teaching practices. The paper argues that bridging the digital gap requires a comprehensive strategy involving infrastructural development, digital archiving initiatives, curriculum reform, capacity building, and regional collaboration among higher education institutions. Ultimately, the paper envisions a more inclusive and technologically enabled literary ecosystem capable of positioning Anglophone West African institutions as active participants in global knowledge production.

178. Bridging the Rural Digital Divide through Technology-Enhanced Agricultural Education in Nigeria

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The fast advancement of digital technologies is transforming global agricultural systems, opening up new opportunities for productivity, revamp and sustainable development. However, significant disparities in digital technology access and literacy persist in Nigeria's urban and rural communities. The rural digital divide limits many students, educators and future agricultural professionals' access to emerging digital tools and knowledge systems. As agriculture embraces digital innovations such as precision farming, mobile-based extension services, artificial intelligence, geographic information systems and data-driven decision-making, agricultural education must play a more strategic role in preparing students to participate in the digital economy. This paper examines the potential for technology-enhanced agricultural education to bridge Nigeria's rural digital divide. It explores how incorporating digital technologies into teaching and learning can improve access to quality agricultural education, promote digital literacy and provide students with the skills needed for modern agricultural practice. The paper emphasizes the role of learner-centered digital pedagogies, such as virtual demonstrations, online collaborative learning, digital simulations, mobile learning applications and smart farming technologies, in increasing student engagement and practical skill development. Drawing on existing literature, policy frameworks and emerging trends in agricultural education, the paper identifies key barriers to the effective adoption of educational technologies in rural institutions, such as inadequate infrastructure, limited internet connectivity, insufficient funding, insufficient teacher capacity and unequal access to digital devices. It also discusses strategies for addressing these challenges, including increased government support, public-private partnerships and investment in rural digital infrastructure, building of capacity for educators and the creation of context-specific digital learning resources. The paper concludes that bridging the rural digital

divide through technology-enhanced agricultural education is critical for producing a resilient, skilled and future-ready agricultural workforce capable of driving Nigeria's agricultural reforming in the digital age.

179. Challenges and Opportunities of Implementing Learner-Centred Digital Pedagogy in Language Education in Nigeria

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The importance of introducing learner-centred digital pedagogy into language education has grown ever more significant as educational institutions aim to improve the effectiveness of teaching, increase learner engagement, and help students develop their 21st-century communication skills. In Nigeria, though, the introduction of learner-centred digital pedagogy is still hindered by a wide range of systemic, infrastructural, and pedagogical problems. This article looks at the challenges and opportunities involved in putting learner-centred digital pedagogy into practice in the field of language education in Nigeria. By taking a conceptual approach, the paper draws together current research on learner-centred learning, digital technologies, and the teaching of languages within the Nigerian educational setting. The study points out the main difficulties, such as poor digital infrastructure, an unreliable electricity supply, weak internet connectivity, a lack of teacher skills in using digital tools, insufficient funding, resistance to changes in teaching methods, large class sizes, and unequal access for learners to digital devices. Nevertheless, there are considerable opportunities available because of the growing availability of mobile technologies, AI-driven learning tools, learning management systems, open educational resources, virtual collaboration platforms, and various government and institutional initiatives promoting digital education. Learner-centred digital pedagogy could contribute to active learning, collaborative communication, personalized language teaching, critical thinking, creativity, greater learner autonomy, and better language proficiency. The paper concludes that for the approach to be successfully implemented, there must be ongoing investment in digital infrastructure, continuous professional development for language teachers, curriculum reforms that incorporate technology-enhanced learner-centred methods, equal access to digital resources, and supportive educational policies. Improving these areas will allow Nigerian educational institutions to make use of digital technologies in order to enhance the quality, inclusiveness, and sustainability of language education.

180. Challenges in Digital Innovation in the Tertiary Education Sector in Nigeria: A Case Study of Ebonyi State

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This paper sets to address the challenges faced by tertiary institutions in Nigeria in terms of digitalization of teaching and learning and other forms of digital innovation in the higher education sector. The research focuses on tertiary institutions in Ebonyi State, Nigeria. Three research questions guided the study. The population of the study is 20,000 and it comprises staff and students of Ebonyi State University Abakaliki and Ebonyi State College of Education Ikwo, two state owned higher institutions selected for the study. The study sample is 1000 which constitutes 5% of the population. Quantative survey research design was employed to collect the data. Findings revealed that certain factors have created digital gaps in mainstreaming and digitalization of teaching and learning including, inadequate technology, lack of steady power supply, lack of funding, lack of digital skills and competencies on part of educators, and lack of digital preservation policy among others. The paper on the strength of these findings makes the conclusion that the enabling environment for a future-ready digital ecosystem is lacking. To address the challenges and bridge the digital divide, the paper recommends some measures such as formulation of digital policy, implementation of digital literacy programs to train educators and students on digital tools, developing user-friendly platforms for online learning, creating virtual labs for practical subjects and implementation of robust data protection measures among others.

181. Challenges of Applying Digital Technology in Federal College of Education, Obudu, Cross River State, Nigeria

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The application of digital technology in educational service delivery at the Federal College of Education (F.C.E.), Obudu, Cross River State, Nigeria, faces several challenges. These hinder effective utilization of digital technology in educational service delivery at the institution. This study examined issues related to teachers' digital preparedness, students' digital literacy, the digital divide, and technical constraints. Four research questions guided the study, while four hypotheses were formulated and tested using the Pearson Product-Moment Correlation Coefficient at the 0.05 level of significance. The study used survey design. The population of the study consists of 450 lecturers and 1200 students. A sample of 45 lecturers and 120 students was randomly selected, and data were collected using two sets of questionnaires. The findings revealed inadequate digital competencies among teachers, limited computer literacy among students, significant digital access disparities, and persistent technical challenges. These factors collectively impede the effective integration of digital technology in teaching and learning in F.C.E. Obudu. The study recommends improvements in teachers' digital pedagogical preparation, introduction of digital literacy to learners at the secondary school levels, and deliberate government efforts at reducing the digital divide by providing free digital access for technology-driven education.

182. Challenges of Integrating AI Tools in Teaching Nigerian English Phonology in Under-Resourced Classrooms

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The assimilation of Artificial Intelligence (AI) tools into English language teaching highlights the transformative potential in the teaching of Nigerian English phonology. However, under-resourced classrooms face critical challenges that hinder the effective adoption and utilization of these digital innovations and technologies. This paper explores the multifaceted barriers confronting teachers and learners such as; inadequate infrastructure, limited digital literacy, poor internet connectivity and the lack of locally relevant AI applications customized to Nigerian phonological features. It is anchored in Technological Pedagogical Content Knowledge (TPACK) and Rogers Diffusion of Innovations Theory. Through qualitative analyses of selected secondary and tertiary institutions, the study highlights how these challenges affect phonological instruction and learner engagement. It further examines the pedagogical implications of AI-driven tools emphasizing the gap between technological innovation and classroom reality. The paper concludes with recommendations for policy reform, curriculum design, and teacher capacity-building, to ensure equitable and effective AI integration in Nigerian English phonology classrooms.

Keywords: *Artificial Intelligence, Nigerian English Phonology, Under-Resourced Classrooms, Speech Technology, Phonological Instruction*

183. Digital extension and auto-delivery strategies for enhancing farmers adoption of organic fertilisers in South-East Nigeria

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The study determines the digital extension and auto-delivery strategies required to enhance farmers' adoption of organic fertilisers in south-east Nigeria. It focuses on the importance of mobile devices, digital extension systems, digital advisories, and digital institutional learning tools in enhancing the awareness and decisions of the farmers. The study adopted a mixed research design for the collection of data from registered farmers, extension agents, and lecturers in the South-East geopolitical zone of Nigeria. The study adopted a proportionate random sampling technique to ensure relative selection of respondents and equal opportunity for the respondents being selected. The study outcomes from inferential statistics and thematic analysis indicate that the use of digital extension and auto-delivery strategies contribute to improved farmers' adoption of organic fertilisers. This study offers insightful practical recommendations that will aid increased investments in rural digital infrastructure, enhancement of farmers' digital literacy, and collaboration between institutions and extension services.

184. Digital Innovation Skills for Sustainable Development Goal Attainment and Future_ready Higher Education In Business Education Programmes in Abia State

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The rapid advancement of digital technologies is transforming higher education globally, thereby creating new opportunities for innovation, sustainable development, and workforce preparedness. This study examined digital innovation skills for Sustainable Development Goal attainment and future-ready higher education in Business Education programmes in Abia State, Nigeria. Five research questions and five hypotheses guided the study. A descriptive survey research design was adopted for the study. The population comprised 36 Business Education lecturers in Colleges of Education in Abia State. The entire population was used since the population was manageable in size. A 55-item structured questionnaire was used for data collection. The instrument was validated by two experts from the department of Business Education and one expert from Measurement and Evaluation unit in the department of Science Education all in Abia State University Uturu. A reliability coefficient of 0.84 was obtained using Cronbach Alpha formula. Mean was used to the answer research questions while t-test was used to test the null hypotheses at 0.05 level of significance. Findings revealed that digital innovation skills such as digital communication and collaboration, artificial intelligence literacy, data management and analytics, digital entrepreneurship, cloud computing, content creation, and problem-solving skills are essential for promoting SDG attainment and developing future-ready graduates. The findings further indicated that these skills enhance educational quality, innovation, employability, entrepreneurial capacity, and lifelong learning. The study concluded that digital innovation skills are critical drivers of sustainable development and future-ready higher education in Business Education programmes. It was recommended, among others, that Colleges of Education should strengthen digital capacity-building initiatives, integrate emerging technologies into Business Education curricula, and invest in digital infrastructure to foster SDG attainment and prepare graduates for the evolving digital economy.

Keywords: *Digital innovation skills, Sustainable Development Goals, Future-ready higher education, Business Education, Digital transformation, Colleges of Education.*

185. Digital Learning and Computer-Based Instruction Management and Effectiveness in Adult Education Outfits in Abia State, Nigeria

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The integration of information and communication technologies (ICT) has transformed instructional delivery and made technology-supported learning increasingly important for lifelong education. This study examined the management and perceived effectiveness of digital learning and computer-based instruction in adult education outfits in Umuahia, Abia State, Nigeria. A descriptive survey design was adopted. The study involved 220 respondents comprising 120 adult learners and 100 facilitators selected through purposive sampling. Data were collected with the Digital Learning and Computer-Based Instruction Management and Effectiveness Questionnaire (DLCBIMEQ), which was validated by experts in Adult Education, Educational Management and Educational Technology at Michael Okpara University of Agriculture, Umudike, and yielded a Cronbach's alpha coefficient of 0.86. Mean and standard deviation were used to answer the research questions. Findings indicated that effective planning, adequate ICT facilities, facilitator competence, reliable internet connectivity and institutional support were perceived as important contributors to instructional delivery and learner engagement, while inadequate funding, poor maintenance of ICT facilities, limited digital literacy and insufficient technical support constrained implementation. The study concludes that effective management of technology-supported instruction is central to adult education delivery and the development of learners' digital competencies. It recommends sustained investment in ICT infrastructure, continuous capacity building for facilitators, regular maintenance arrangements and institutional policies that support sustainable technology integration. The findings are survey-based perceptions and do not directly measure learning gains.

Keywords: *digital learning, computer-based instruction, instructional management, effectiveness, adult education*

186. Digital Pedagogy Adoption and Usage: Examining the Challenges and Opportunities among Lecturers in Select Tertiary Institutions in Nasarawa State, Nigeria

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The digital age has increasingly ushered in the growing need for the adoption and integration of Information and Communication Technology in all aspects of human endeavours. In the teaching profession, digital technology has continued to broaden its scope, though with some issues. Therefore, this study examined the challenges and opportunities of the adoption and use of digital technology for teaching among lecturers in some universities in North Central Nigeria. The study was explained within the framework of the Technology Acceptance Model and the Unified

Theory of Acceptance and Use of Technology. It collected data from respondents using the survey design. Findings revealed that ICT use in teaching leads to enhanced productivity, and allows for global collaboration and flexibility in learning. The study further found unstable power supply, poor Internet connectivity, inadequate ICT facilities, gaps in usage of ICT and constraints due to poverty among students as challenges affecting the full use of ICT in teaching. The study concluded that though the adoption and integration of ICT in teaching encounters infrastructural bottlenecks, it offers profound opportunities to teaching. The study recommended human capital building for lecturers through continuous professional development training workshops and seminars. Also, government should improve ICT-support infrastructure such as Internet and electricity.

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Keywords: *Challenges, digital, opportunities, pedagogy, usage*

187. Digital Pedagogy and Curriculum Innovation in Colleges of Education: Academic Staff Adoption, Challenges and Impacts on Students ' Learning Outcome

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Emerging technologies have rapidly changed higher education around the globe and has forced tertiary institutions to implement new teaching effectiveness to enhance students' learning outcome. The study examined academic staff adoption levels, challenges and perceived impact on students' learning outcome of digital pedagogy and teaching innovation in Nigeria Colleges of Education. The researcher used a mixed-method survey design covering 1200 academic staff and 480 qualitative participants. Results suggest that adopting digital pedagogy predict positive students' engagement, performance, critical thinking and collaboration. Thematic findings indicate that teaching innovation makes learning flexible and personalized along with interactive classroom teaching. Digital pedagogy has the potentials for a greater higher education in Nigeria, the study finds. It is recommended that the government allocate more resources to digital infrastructure, build institutional capacity, provide continuous professional development for lecturers, as well as put in place policies that promote inclusive and sustainable digital learning ecosystems.

188. Digital Pedagogy and School Counselling Services: Predictors of Academic Adjustment among Secondary School Students in Abia State, Nigeria

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This study examined digital pedagogy and school counselling services as predictors of academic adjustment among secondary school students in Abia State. The study was guided by three objectives and three corresponding hypotheses. A correlational research design was adopted. The population comprised all public secondary school students in Abia State, while a sample of N = 420 students were selected using a multistage sampling technique. Data were collected using three validated instruments: Digital Pedagogy Scale (DPS), School Counseling Services Scale (SCSS), and Academic Adjustment Scale (AAS). The instruments yielded reliability coefficients of 0.82, 0.79, and 0.85 respectively using Cronbach Alpha. Data were analyzed using Pearson Product Moment Correlation and Multiple Regression Analysis at a 0.05 level of significance. The results revealed that digital pedagogy had a significant positive relationship with academic adjustment ($r = 0.61$, $p < 0.05$). School counselling services also showed a significant positive relationship with academic adjustment ($r = 0.58$, $p < 0.05$). The multiple regression analysis indicated that digital pedagogy and school counselling services jointly predicted academic adjustment significantly, accounting for $R^2 = 0.52$ (52%) of the variance in academic adjustment. Specifically, digital pedagogy contributed more strongly ($\beta = 0.41$, $t = 8.32$, $p < 0.05$) than school counselling services ($\beta = 0.36$, $t = 7.15$, $p < 0.05$). The study concluded that both digital pedagogy and school counselling services are strong predictors of academic adjustment among secondary school students in Abia State. It was recommended that schools should strengthen ICT integration in teaching and improve the availability and effectiveness of counselling services to enhance students' academic adjustment.

189. Digital Pedagogy and Teaching Innovation in Higher Education in Africa

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Theme: Bridging the Digital Divide: Reimagining Future-Ready Higher Education Ecosystem in Africa

Abstract The rapid digital innovation is significantly transforming global education systems, yet higher education in Africa remains largely underprepared to harness these innovations. This paper explores digital pedagogy and teaching innovation in higher education across the continent, with a focus on the challenges, opportunities, and strategies for meaningful integration. The central problem lies in the widening gap between the evolving demand of 21st-century education and the outdated methodologies still prevalent in many Africans higher institutions. Utilizing a qualitative research approach, the study engages with educators, policymakers, and teacher-trainees across selected African countries through interviews and focus group discussions. The findings reveal critical issues such as lack of infrastructure, limited digital literacy among teacher educators, resistance to change, and insufficient policy frameworks that hinder the pedagogic innovative technologies in higher education in Africa. However, the study also uncovers promising practices and grassroots innovations that demonstrates the potential for transformative change. The paper emphasizes the need to reconceptualize higher education curricula, integrate digital competency training, and develop collaborative networks between governments, institutions, and technology companies. It concludes with actionable recommendations, aimed at equipping African higher education systems for the digital age. These include investing in capacity-building programmes, creating policy environments that support innovation, and ensuring equitable access to technological resources. This study contributes to the growing body of literature on educational technology in Africa and provides a strategic roadmap for aligning higher education with the continent's broader goals for inclusive and future-ready learning environments.

Keywords: *Digital, Pedagogy, teaching, innovation, Higher Education and Africa.*

190. Digital Pedagogy and Teaching Innovation in Language Education

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The rapid growth of digital technologies has significantly transformed educational practices and created new opportunities for innovative teaching and learning. In language education, digital pedagogy has emerged as an effective approach that integrates technology with instructional strategies to enhance learners' engagement, participation and academic achievement. This paper examines the role of digital pedagogy in advancing learner-centred pedagogies through digital innovation in language education. It discusses the concept of digital pedagogy and highlights how digital tools and platforms support interactive, collaborative and personalized learning experiences. The paper explores various digital technologies, including learning management systems, mobile learning applications, artificial intelligence, virtual learning environments and multimedia resources that facilitate effective language teaching and learning. The study further examines the benefits of digital innovation in language education, such as increased learner autonomy, improved communication skills, enhanced collaboration, access to authentic language materials and greater flexibility in learning. In addition, digital technologies promote active learning, critical thinking, creativity and self-directed learning, which are essential components of learner-centred pedagogy. Despite these advantages, challenges such as inadequate technological infrastructure, digital inequality, limited access to digital devices and insufficient teacher preparedness continue to hinder effective implementation. The paper concludes that digital innovation has the potential to transform language education by creating engaging and inclusive learning environments that support the diverse needs of learners. It recommends sustained investment in digital infrastructure, continuous professional development for educators and the development of supportive educational policies to ensure the effective integration of digital pedagogy into language education.

191. Digital pedagogy and teaching innovation: Advancing learner-centered pedagogies through Digital innovation

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This paper examines the transformative role of digital pedagogy and teaching innovation in advancing learner-centered pedagogies within contemporary higher education. The increasing integration of digital technologies into educational systems has created opportunities for more interactive, flexible, and personalized learning experiences that place learners at the center of the teaching and learning process. Drawing on emerging developments in educational technology, the paper explores how digital tools such as learning management systems, artificial

intelligence, virtual learning environments, mobile learning applications, and collaborative online platforms can enhance student engagement, knowledge construction, critical thinking, creativity, and self-directed learning in Nigera's higher Institutions arena. Shifting from traditional teacher-centered approaches to more participatory and technology-enhanced models, digital pedagogy fosters active learning and supports the development of competencies required for success in the twenty-first-century knowledge economy. This paper further investigates the opportunities and challenges associated with the implementation of digital innovation in higher education institutions. While digital technologies have the potential to improve access to quality education, promote inclusivity, and facilitate lifelong learning, their effective utilization is often constrained by inadequate technological infrastructure, limited digital literacy, unequal access to digital resources, and resistance to pedagogical change. The paper argues that successful adoption of learner-centered digital pedagogies requires strategic institutional support, continuous professional development for educators, and sustainable investment in educational technologies. It concludes that digital pedagogy and teaching innovation are critical drivers of educational transformation, capable of enhancing learning outcomes, improving student participation, and preparing graduates with the skills, adaptability, and digital competencies necessary to thrive in an increasingly interconnected global society.Keywords: Digital Pedagogy; Teaching Innovation; Learner-Centered Learning; Technology;

192. Digital Pedagogy and Teaching Innovation: Advancing Learner-Centered Pedagogies Through Digital Innovation in the Teaching and Learning of Mathematics

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The advancement of digital technologies has transformed educational practices, creating new opportunities for innovative and learner-centered approaches to mathematics education. Digital pedagogy integrates technological tools, digital resources, and interactive learning environments to enhance teaching effectiveness and improve students' engagement. This paper examines how digital innovation supports learner-centered pedagogies in mathematics by promoting active participation, collaboration, critical thinking, and personalized learning experiences. Through the use of technologies such as learning management systems, virtual manipulatives, educational applications, and online assessment platforms, learners can explore mathematical concepts in more meaningful ways and interactive ways. Digital tools also enable teachers to differentiate instruction, provide immediate feedback, and monitor students' progress effectively. The study highlights the role of digital pedagogy in shifting mathematics instruction from traditional teacher-centered methods approaches that empower learners to construct knowledge, solve real-world problems, and develop higher-order thinking skills. Additionally, it discusses challenges associated with technology integration, including digital literacy gaps, infrastructure limitations, and equitable access to digital resources. The paper concludes that the successful implementation of digital pedagogy requires continuous teacher professional development, supportive educational policies, and strategic investment in technological infrastructure. By leveraging digital innovations, educators can create inclusive, engaging, and adaptive mathematics learning environments that enhance students' achievement and prepare learners for the demands of the digital age.

Keywords: *Digital pedagogy, teaching innovation, learner-centered learning, mathematics education, educational technology, digital learning, personalized learning, mathematics instruction.*

193. Digital Pedagogy and Teaching Innovation: Advancing Learner-centred Pedagogies in Physics Education at Nigeria Colleges of Education Through Digital Innovation

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CONTENT The physics education program at the College of Education, as outlined by the National Commission for Colleges of Education (NCCE) in Nigeria, aims to deliver advanced scientific knowledge, enhance research and laboratory skills, prepare students for careers in science and technology, and foster innovation and national progress. Nevertheless, the pursuit of these commendable goals often encounters significant obstacles in developing countries like Nigeria, stemming from issues such as inadequate funding, poor infrastructure, insecurity, limited institutional support, and insufficient student-centered approaches. The emergence of digital pedagogy has greatly changed educational practices, presenting opportunities for enhancing teaching and learning of physics education. Incorporating learner-centered pedagogies into physics education promises to establish a supportive academic environment, boost student interest, create an interactive educational framework, improve academic performance, cultivate critical thinking skills, enhance the quality of scientific workforce development, encourage academic

dynamism, facilitate active student participation, and address the increasing demands of learners along with the community's desire for technological expertise. Consequently, this paper examines various digital pedagogical approaches in physics education, the impact of digital innovation on student motivation, the consequent improvement in academic performance, and the benefits and challenges of digital technology in the digital age. Recognizing that digital teaching innovation offers a transformative paradigm in global education systems and creates a platform for greater potential in physics education, this paper advocates for the adoption of digital pedagogical practices by education stakeholders, intentional implementation by educators, optimization by higher education institutions, funding by the government, and institutional support by school leadership.

Keywords: *Digital Innovation, Digital Pedagogy, Learner-Centred Pedagogy, Physics Education, Teaching Innovation.*

194. Digital Pedagogy and Teaching Innovation: Advancing learner-centred Pedagogies through Digital Innovations

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The landscape of higher education teaching and learning has undergone a profound reconfiguration over the past two decades, driven by the convergence of digital technologies, evolving pedagogical theory, and shifting expectations about what constitutes meaningful learning. This article offers a broad examination of digital pedagogy as both a field of practice and an evolving philosophy of teaching, with particular attention to how digital innovation has enabled — and in some cases compelled — a decisive shift away from instructor-centred, transmission-based models of teaching toward learner-centred approaches that prioritise active engagement, personalisation, agency, and authentic application of knowledge. The article surveys the conceptual foundations of learner-centred pedagogy and digital pedagogy as intersecting traditions; examines a wide spectrum of digital innovations — including adaptive learning systems, collaborative and active-learning technologies, flipped and blended models, gamification, artificial intelligence-enabled tutoring and feedback, learning analytics, and immersive technologies — and analyses their pedagogical rationale, evidence base, and comparative adoption across institutional and disciplinary contexts. The analysis gives sustained attention to the tensions and risks accompanying this transformation, including digital inequity, the uneven readiness of teaching staff, the contested role of generative artificial intelligence in assessment and authorship, and the danger of mistaking technological novelty for pedagogical improvement. The article concludes by proposing an integrative orientation for institutions and educators: that digital innovation should be evaluated and adopted not on the basis of technological sophistication, but on the basis of its demonstrated capacity to deepen learner agency, engagement, and meaningful understanding.

Keywords: *digital pedagogy, learner-centred learning, teaching innovation, educational technology, active learning, blended learning, learning analytics, artificial intelligence in education.*

195. Digital pedagogy and Teaching innovation: Assessing the integration of Technology in Entrepreneurship Education in colleges of education in Nigeria

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Digital pedagogy refers to the intentional use of digital tools and online strategies to enhance teaching and learning. With the global shift toward technology-driven education and the Federal Government's push for graduate entrepreneurship, Colleges of Education are expected to innovate their teaching methods. However, the extent to which lecturers in Entrepreneurship Education integrate digital tools for teaching innovation remains underexplored in COEs. This study examined digital pedagogy and teaching innovation among lecturers and NCE students in the Department of Entrepreneurship. The specific objectives were to: 1) identify the digital tools available for teaching entrepreneurship, 2) assess the level of lecturers' competence in applying digital pedagogical strategies, 3) determine the effect of digital teaching innovation on students' engagement and learning outcomes, and 4) identify challenges militating against effective integration of digital pedagogy. The study adopted a descriptive survey design. A structured questionnaire was administered to all entrepreneurship lecturers and a sample of 150 NCE II & III students using simple random sampling. Data were analyzed using simple correlation. Findings revealed that while basic digital tools like smartphones, WhatsApp, and PowerPoint are available, advanced tools such as LMS, simulation software, and Canva for business plan design are underutilized. There was a significant positive relationship between lecturers' use of digital pedagogy and students' engagement in practical entrepreneurship tasks. Major challenges identified included poor internet access, inadequate ICT training for lecturers, and erratic power supply. The study concluded that digital

pedagogy significantly enhances teaching innovation in entrepreneurship education, but its impact is limited by infrastructural and competence gaps. It was recommended that TETFUND and the College management should prioritize regular ICT training, provision of stable internet, and integration of digital tools into the NCE entrepreneurship curriculum to produce graduates who are both pedagogically sound and digitally competent.

Keywords: Digital pedagogy, Teaching innovation, Entrepreneurship Education, Colleges of Education, ICT integration

196. Digital Pedagogy and Teaching Innovations in Teacher Training Institutions in Nigeria

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Digital transformation is reshaping the nature of teaching and learning and is creating new expectations for teacher-training institutions to prepare teachers who can effectively integrate digital technologies into classroom practice. This paper examines digital pedagogy and teaching innovations in teacher-training institutions in Nigeria, with particular attention to Colleges of Education, that has the mandate to train teachers for basic education. Digital pedagogy extends beyond the mere use of computers, mobile devices or online platforms; it involves the purposeful integration of technology, pedagogy, content, assessment and learner engagement to improve educational experiences and outcomes. The paper adopts a conceptual and literature-based approach to examine the meaning and dimensions of digital pedagogy, contemporary teaching innovations, opportunities, challenges and strategies for strengthening digital teacher education in Nigeria. Evidence indicates that Nigerian teacher educators' technological knowledge and knowledge of technology integration are important factors associated with technology integration, while inadequate infrastructure, unreliable electricity, limited digital resources, insufficient professional development and weak ICT-pedagogical practices remain significant barriers. The researchers focused mainly on blended learning, flipped classrooms, mobile learning, learning management systems, virtual classrooms, digital assessment, open educational resources, collaborative online learning, simulation, multimedia instruction and responsible use of artificial intelligence. The researchers affirm that successful digital transformation requires more than the provision of devices; it requires sustained professional development, institutional leadership, reliable connectivity and electricity, curriculum redesign, technical support, digital-content development, inclusive access and appropriate quality-assurance mechanisms. The authors recommend an integrated institutional framework for digital pedagogy in which teacher educators model effective technology use and student teachers repeatedly practise designing, implementing and evaluating technology-enhanced lessons. Such an approach can strengthen the preparedness of Nigerian teachers for contemporary classrooms and contribute to quality, equity, innovation and lifelong learning.

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Keywords: *digital pedagogy, teaching innovation, teacher education, teacher training institutions, ICT integration, digital competence, Nigeria*

197. Digital Pedagogy and Teaching: Advancing Learner-Centered Pedagogy Through Digital Innovation

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Digital pedagogy redefines teaching by placing learners at the centre of technology-facilitated environments that emphasize agency, collaboration, and personalized learning. This paper examines how digital innovations, including adaptive learning systems, interactive multimedia, and collaborative online tools, advance personalized and engaged learning. These technologies enable educators to move beyond passive content delivery toward active knowledge construction, differentiated instruction, and real-time feedback. Key components include learning management systems (LMS) for tailored pacing, gamification to enhance motivation, and data analytics to identify individual learner needs. Moreover, digital pedagogy cultivates critical competencies such as problem-solving, digital literacy, and self-directed inquiry, equipping students for a rapidly evolving world. The paper shows improved engagement, deeper conceptual understanding, and greater self-regulation when evidence-based digital practices are integrated with learner-centered assessment and inclusive design. Nevertheless, successful implementation depends not only on access to technology but also on strategic shifts in instructional design and teacher training that prioritize student agency. This paper argues that, when applied thoughtfully, digital innovation serves as a powerful catalyst for building

inclusive, responsive, and learner-centered classrooms. Ultimately, advancing digital pedagogy is essential for fostering lifelong learners who thrive in participatory, technology-facilitated environments, ensuring that education remains relevant and effective in the twenty-first century.

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Keywords: *Advanced digital pedagogy, digital innovations, learning management systems (LMS), adaptive learning systems, interactive multimedia, and collaborative online tools, advance personalized and engaged learning.*

198. Digital Pedagogy andThe Teaching of Hausa Language and Literature in Nigeria Higher Education: Bridging The Digital Divide in Indigenous Language Studies

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The teaching and learning of Hausa language and literature in Nigerian higher educational institutions have historically depended on traditional pedagogical methods that, while rich in cultural tradition, are increasingly unable to meet the scale, diversity, and quality demands of contemporary higher education. In an era defined by digital transformation, the integration of digital pedagogical tools into indigenous language education represents both a significant opportunity and an underexplored frontier. This paper examines how digital pedagogy is reshaping the teaching of Hausa language and literature in Nigerian colleges of education and universities, with specific attention to its implications for learner-centred instruction, access, quality, and the preservation of Hausa linguistic and literary heritage in a digital age. Drawing on a conceptual analysis of relevant literature in language pedagogy, educational technology, and African linguistics, and anchored in the Technological Pedagogical Content Knowledge (TPACK) framework of Mishra and Koehler (2006), the paper argues that digital pedagogy holds transformative potential for Hausa language education when it is thoughtfully integrated with a deep understanding of the linguistic, cultural, and institutional specificities of the Hausa studies context. The study finds that digital tools including corpus-based learning platforms, audio-visual resources, mobile language applications, and computer-mediated communication environments offer compelling pedagogical advantages for the teaching of Hausa oral literature, tonal phonology, and written composition, while also presenting challenges related to content localisation, digital literacy, and the risk of marginalising oral dimensions of Hausa literary tradition. The paper concludes with a set of recommendations for curriculum developers, language educators, and institutional leaders committed to building future-ready Hausa studies programmes in Nigerian colleges of education.

Keywords: *digital pedagogy, Hausa language, Hausa literature, indigenous language education, TPACK, higher education, Nigeria, digital innovation, language technology*

199. Digital Pedagogy as Predictors of Students' Classroom Engagement: Implication for Global Best Practices in Nigerian Colleges of Education

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This study examined digital pedagogy as predictors of students' classroom engagement in Nigerian Colleges of Education, with a view to determining its implications for the adoption of global best practices in teacher education. The study was necessitated by the increasing integration of digital technologies into higher education and the persistent concern about students' cognitive engagement in classroom activities. A correlational research design was adopted for the study. The population comprised of 1,380 N.C.E students from two Nigerian Colleges of Education namely: Akwa Ibom State College of Education Afaha Nsit and Federal College of Education Ididep from which a sample of 470 students were selected using a multistage sampling procedure. Data were collected using a researcher-developed instrument titled Digital Pedagogy and Students' Classroom Engagement Questionnaire (DP-SCEQ). The instrument was face validated by experts and yielded a reliability coefficient of 0.80 which was determined using Cronbach Alpha reliability analysis, indicating satisfactory internal consistency. Four research questions were formulated, and four corresponding null hypotheses were tested at 0.05 level of significance. Data collected were analysed using the simple linear regression analysis. The findings revealed that digital pedagogy had a significant positive relationship with students' classroom engagement. Specifically, digital instructional competence, interactive technology integration, flipped classroom and personalised/blended learning practices significantly predicted students' classroom engagement The study concluded that purposeful and pedagogically appropriate integration of digital technologies enhances students' active participation, interest, interaction, collaboration and cognitive involvement in classroom learning. The study therefore recommended, among other things, continuous

professional development for teacher educators in digital pedagogy, as well as the adoption of internationally informed but contextually responsive technology-enhanced teaching practices. The study contributes empirical evidence to the discourse on digital transformation in Nigerian teacher education and provides a basis for strengthening classroom engagement through digital pedagogy in line with emerging global best practices.

200. Digital Pedagogy for Effective Teaching and Learning: A Pathway to Educational Advancement in Africa

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Digital pedagogy remains the integration of digital technology into teaching and learning. This paper focuses on the advantages that come with digital technologies in the teaching and learning process. The advantages include, but are not limited to, the following: for teachers, streamlined organization, enhanced collaboration, data-driven insights, up-to-date materials and inclusive classrooms. On the part of the students, digital pedagogy enhances personalized education, self-paced learning, flexibility in learning, cost effectiveness and real-time feedback. Findings reveal that the effective application of digital pedagogy in teaching and learning substantially facilitates the transmission of knowledge from teachers to learners. The paper concludes and recommends that institutions of learning should focus on the application of digital learning technologies and practice to meet the much needed advancement in the present digital world.

Keywords: *Pedagogy, teaching, learning*

201. Digital Pedagogy Fostering Learning Motivation in Higher Education in North-Eastern Nigeria: Challenges and Opportunities

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As higher education undergoes rapid digital transformation, digital literacy has become a foundational competency for students and faculty. Digital pedagogy has become an essential tool in the education sector, offering opportunities to enhance student engagement, creativity, and access to knowledge. This study has investigated the use of digital pedagogy in teacher education programmes, focusing on its potential to boost learning motivation among prospective teachers, thereby creating more dynamic and personalized learning environments. The study has analysed digital pedagogy and teacher education documents, emphasizing its growing importance for adapting to technological advancements, enhancing learning opportunities, supporting personalized learning, developing digital literacy, preparing educators for remote teaching, and promoting global learning. The findings of the study have been disclosed that digital pedagogy significantly enhances learning motivation among prospective teachers by offering engaging, flexible, and meaningful learning experiences. Interactive tools such as gamification, virtual simulations, and collaborative platforms allow learners to actively participate and experience the practical relevance of what they are studying. Personalized learning paths, access to diverse resources, real-time feedback, and innovation and creativity support both professional growth and student engagement. Digital pedagogy can transform teacher education by fostering motivation and innovative teaching approaches. However, challenges include unequal access to technology, lack of digital literacy, inadequate support, and challenging assessments. A balanced approach, including technology investment, professional development, and selfdirected learning can prepare future educators. Keywords: Digital Ped

202. Digital Pedagogy in Language Education: Challenges and Opportunities for Effective Teaching and Learning in Tertiary Institution in Africa

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Digital pedagogy is revolution method that enhances interactive, engaging and effective teaching and learning experiences in language education, leveraging digital resources, such as simulations, digital labs and data driven insights, improves students understanding of complex language education concepts and fosters critical thinking skills. However, the successful integration digital teaching methods in Nigeria faces challenges, including adequate infrastructure, digital literacy gaps, high costs, and curriculum issues. Teacher often lack the necessary training to effectively utilise digital tools, while student particularly in rural areas, encounter limited access to essential devices

and internet connectivity. Addressing these obstacles requires collaboration among stakeholders and thoughtful interventions. Key strategies include investing on infrastructure, providing digital literacy training for educators, developing language focus digital content aligned with the national language policy and promoting public sector partnership, furthermore, policies promote equity should ensure that marginalised community benefit from digital teaching method, by implementing these strategies, Nigeria can harness the power the digital pedagogy to transform language education, preparing student for carrier in arts, humanities, science, technology and engineering and adapting to the global shift toward digital educational environments.

Keywords: *Digital, pedagogy, teaching and learning, language education, tertiary institution.*

203. Digital Pedagogy Revolution: Emphasizing Teaching Innovation

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This study explores the multifaceted role of digital innovation in advancing teaching, learning, research, and institutional development, with particular emphasis on its potential to bridge gaps in equity and sustainability. At the pedagogical level, digital innovation enables learner-centered approaches that prioritize flexibility, personalization, and interactivity. Online learning platforms, artificial intelligence-driven tutoring systems, and immersive technologies such as virtual and augmented reality are revolutionizing how knowledge is delivered and consumed. These tools not only enhance student engagement but also expand opportunities for lifelong learning, thereby aligning higher education with the demands of rapidly changing labor markets. Moreover, digital innovation fosters inclusivity by providing alternative pathways for marginalized groups, ensuring that higher education becomes more accessible across diverse socio-economic contexts. Institutionally, digital transformation extends beyond pedagogy to encompass governance, infrastructure, and research ecosystems. Smart campuses, cloud-based systems, and data-driven decision-making are redefining how universities operate, manage resources, and interact with stakeholders. In research, digital platforms facilitate collaboration across borders, enabling knowledge exchange and innovation at unprecedented scales. Importantly, digital innovation also aligns higher education with global sustainability agendas, as institutions leverage technology to reduce environmental footprints and contribute to the Sustainable Development Goals (SDGs).Despite these advancements, challenges remain. Issues of digital equity, cybersecurity, and the ethical use of emerging technologies must be addressed to ensure that innovation does not exacerbate existing inequalities. The future of higher education will depend on collaborative efforts among educators, policymakers, industry leaders, and development partners to harness digital innovation responsibly and inclusively. Ultimately, digital innovation represents not merely a technological shift but a paradigm transformation—one that reimagines higher education as a dynamic, equitable, and future-ready ecosystem.

Keywords: *Artificial Intelligence, cybersecurity, interactivity, digital innovation, ecosystem*

204. Digital Pedagogy, Emerging Technologies and Future Learning in Adult Education in Abia State, Nigeria: Prospects and Challenges

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This study investigated digital pedagogy, emerging technologies and future learning in adult education in Abia State Nigeria, focusing on prospects and challenges. Three research questions guided the study. The study adopted a descriptive survey design. The population comprised 300 facilitators in 145 adult education centres across the 17 Local Government Areas of Abia State, from which a sample of 171 facilitators was drawn using Slovin's formula and a two-stage sampling procedure. Data for the study were collected using a structured questionnaire titled " Prospects and Challenges of Digital Pedagogy and Emerging Technologies for Future Learning in Adult Education Questionnaire (PCDPETFLAEQ)". The instrument was structured on four-point rating scales. The questionnaire was validated by three experts and Its reliability was established using Cronbach Alpha which yielded an overall coefficient of 0.85. Mean and standard deviation were used to answer the research questions, with a decision criterion of 2.50. Data were collected through direct administration with the help of four trained research assistants, and 161 correctly completed copies (94%) were retrieved and used for analysis. Findings from the study revealed that Digital pedagogy offers prospects such as flexible and self-paced learning, wider access for working adults, learner-centred and collaborative learning, and use of learning management systems and online resources. Similarly, findings from the study revealed that Emerging technologies hold prospects for personalised learning, skill development, and continuous access to learning. Finally, the findings revealed that Challenges include inadequate funding and infrastructure, poor internet

connectivity, unstable electricity, low digital skills among facilitators and learners, high data costs, and weak policy support. The study among other recommended that adult education providers in Abia State should integrate digital pedagogy into adult education programmes by adopting learning management systems and providing flexible, self-paced online and blended options, so that working adults can access learning at times convenient to them.

Keywords: *Digital pedagogy, Emerging technologies, Future learning, Adult education, Abia State, Nigeria*

205. Digital Pedagogy, Translation, and Innovation in Africa: Reimagining Learner-Centred Classrooms

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Across Africa, more than 2,000 indigenous languages coexist with colonial languages that continue to dominate formal education. This linguistic mismatch limits learner participation, reinforces teacher-centered instruction, and constrains meaningful learning. This study examines how digital pedagogy, integrated with translation and localisation, can support learner-centered classrooms across African contexts. A qualitative multiple-case study design was employed, drawing on data from three digital education initiatives implemented in Nigeria, Kenya, and South Africa between 2023 and 2025. The findings identify three major innovations: AI-assisted, community-validated translation of learning materials into local languages; multilingual mobile and offline learning platforms that improve access in low-connectivity environments; and the co-creation of Open Educational Resources with local educators to ensure cultural and linguistic relevance. Across the cases, learners who accessed instructional content in familiar languages through accessible digital tools demonstrated greater participation, improved comprehension, and stronger learner agency. However, the study also identifies persistent barriers, including the digital divide, uneven machine translation quality for many African languages, and limited teacher capacity to integrate digital technologies effectively. The paper concludes that digital innovation promotes educational inclusion only when technologies are intentionally designed around learners' linguistic, cultural, and contextual realities, and recommends greater investment in multilingual digital infrastructure, teacher professional development, and locally driven educational technologies.

Keywords: *Digital pedagogy, translation, localisation, learner-centered education, multilingual education, Africa, educational technology.*

206. Digital Revitalisation: Leveraging Localised Content and Language Technologies to Preserve Indigenous Languages in Higher Education

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In an increasingly globalized academic landscape, indigenous languages face structural maginalisation within higher education, often restricted to informal discourse, while English, Chinese, Arabic, French and other European languages dominate formal instruction and research. This systemic sidelining threatens linguistic diversity and limits cultural relevant pedagogy. This paper examines how higher education institution leverage digital innovation to actively preserve, document and teach indigenous languages. Specifically, the investigate the implementation of localized digital content such as speech-to-text technologies, mobile –assisted language learning (MALL) applications, and collaborative open –access digital dictionaries within higher education curricula. Using case study approach combined with linguistic text analysis, this study evaluates the development and deployment of digital tools designed to translate, digitise and analyse complex morpho-syntactic and phonological structures of local language within higher language programs. The study analyse student engagement, translation accuracy and oral proficiency across experimental cohorts utilising these localized platforms. Preliminary results indicate that incorporating interactive digital interfaces significantly enhances student motivation, deepens morphological comprehension and democratise access to rare linguistic archives. Furthermore, the study demonstrates that digital localization empowers native-speaking students to conduct high-level academic research in their mother tongue, bridging the gap between traditional cultural knowledge and modern technological frameworks. Ultimately, this research provides a sociable blueprint for College administrators, linguist, and educational technologist to deconolise the curriculum. The study argues that strategic investment in language technologies can transform higher education institutions into vital sanctuaries for linguistic preservation, ensuring that digital innovation serves to celebrate, rather than erase regional cultural identities.

Keywords: *language preparation, digital localization, HEIS (Indigenous Languages in Higher Education), Computer-Assisted Language Learning (CALL)*

207. Digital Technology Devices and Lecturers' Effectiveness in Teaching English Language in Colleges of Education in Oyo State

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The study surveyed digital technology devices and lecturers' effectiveness in teaching English language in colleges of education in Oyo State. A descriptive cross-sectional survey design was adopted, and the population comprised of 715 lecturers across the colleges of education in the state. Using purposive sampling method, 58 lecturers that teach English language were selected, while a self-structured questionnaire was employed for data collection. Descriptive statistics including frequency counts, percentages, mean, and standard deviation were used to answer the research questions, while Analysis of Variance (ANOVA) was used to tested the hypotheses at the 0.05 level of significance. Findings revealed that smartphones (96.6%), audio systems (79.3%), webcams/digital cameras (79.3%), computers (72.4%), and multimedia projectors (53.4%) were the most available digital technology devices, while AI-powered language learning tools (20.7%) and Smart TV sets (6.9%) were the least available. Lecturers were very effective in teaching English language ($\bar{x}$= 3.18±0.52); exhibited low level of digital technology usage ($\bar{x}$= 2.48 ± 0.40); and inferred constraints to digital technology device usage as very severe ($\bar{x}$= 2.81±0.61). Furthermore, availability of digital technology devices (F2,55= 5.565; p= 0.001; η2= 0.175); competence in device usage (F2,55 = 8.565; p= 0.001; η2= 0.237); digital technology usage (F2,55= 7.936; p= 0.001; η2= 0.224); and constraints to digital technology devices usage (F2,55 = 6.856; p= 0.002; η2= 0.200) significantly influenced lectures' effectiveness in teaching English language. The study therefore recommends increased provision of modern digital technologies, reliable internet facilities, and institutional technical support to enhance technology adoption and teaching effectiveness.

Keywords: *Digital Technology Devices, Effectiveness in Teaching, AI-powered language learning tools, digital competence, multimedia projectors. Word Counts: 248*

208. Digital Tools Deployment for Atmospheric Physics Instruction in Schools: A Comparative Analysis

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The integration of digital technologies into science education has transformed the teaching and learning of atmospheric physics across educational institutions worldwide. Atmospheric physics, which deals with the physical processes governing weather, climate, radiation and atmospheric dynamics, often presents abstract concepts that are difficult for learners to visualize using conventional teaching approaches. Consequently, digital tools such as simulations, virtual laboratories, Geographic Information Systems (GIS), remote sensing applications, mobile learning platforms, and artificial intelligence-based educational technologies have emerged as valuable instructional resources. This study comparatively examines the deployment of digital tools in atmospheric physics instruction in selected secondary schools and tertiary institutions. Using a mixed-method research design, data were collected from 240 students and 40 physics teachers through questionnaires, classroom observations, and achievement tests. Findings indicate that institutions utilizing advanced digital instructional tools recorded significantly higher student engagement, conceptual understanding, and academic performance than those relying predominantly on traditional teaching methods. The study further reveals disparities in access, teacher competence, infrastructure, and institutional support between urban and rural schools. Recommendations include increased investment in educational technology infrastructure, teacher training programmes, and the development of locally relevant atmospheric physics digital content.

209. Digital Tools for Smart Farming Education: Integrating IoT, Drones, and Sensors into Agricultural Curricula of Colleges of Education in Nigeria

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The emergence of Agriculture 4.0 has transformed agricultural practices through the adoption of digital technologies such as the Internet of Things (IoT), drones, and smart sensors for precision farming. Despite these advancements,

agricultural teacher education in Nigerian Colleges of Education remains largely traditional, limiting graduates' preparedness for a technology-driven agricultural sector. This paper explores the integration of smart farming technologies into agricultural education curricula as a pathway to developing future-ready teachers and reducing the digital skills gap. The study adopts a mixed-methods approach involving a survey of agricultural education lecturers and NCE students from selected Colleges of Education in Nigeria, complemented by interviews with curriculum experts and ICT administrators. In addition, the current NCE Agricultural Education curriculum will be analysed to identify gaps in digital technology content. The study investigates the level of awareness and accessibility of smart farming technologies, the digital competencies of lecturers and students, and the institutional factors influencing curriculum integration. The findings are expected to provide evidence-based recommendations for embedding digital agricultural technologies into teacher education programmes. The paper argues that curriculum innovation, strengthened institutional support, and strategic partnerships are essential for preparing competent agricultural educators capable of equipping future farmers with the digital skills required for sustainable agricultural development in Nigeria and across Africa.

210. Digital Trasnformatiom, a tool for social studies development in Nigeria

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The rapid integration of digital technologies has revolutionized education delivery globally making digital transformation an imperative for Nigeria because social studies education is fundamentally designed to equip learners with the civic social and problem solviay skills needed to understood and improve their society, its pedagogical approach must evolve to reflect the digital age. This study explores how digital transformation serves as an essential tool for social studies development, transforming traditional, teacher-centered classroom into dynamic interactive and learner-Centre environment. This paper also examines the sustainable development in social studies. Finally, Recommendations are made towards the sustainable digital development in social studies in Nigeria.

Keywords: *Digital transformation, social studies, pedagogical approach, sustainable development.*

211. Digitalizing Building Education in Nigerian Polytechnics: “Building Information Modelling, Virtual Reality, and Artificial Intelligence as Tools for Closing the Skills Gap in Africa’s...

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Africa’s construction industry is rapidly adopting Building Information Modelling (BIM), Virtual Reality (VR), and Artificial Intelligence (AI) to improve design coordination, safety training, and productivity. However, Nigerian polytechnics, which produce middle-level manpower for the sector, still rely heavily on analogue teaching methods. This mismatch has created a widening digital skills gap, contributing to poor enforcement of professional standards by the Council of Registered Builders of Nigeria (CORBON) and recurrent building collapse incidents. The challenge is worsened by Africa’s digital divide characterized by erratic power supply, poor internet, high cost of software, and low digital literacy among lecturers and students. This study investigated how Nigerian polytechnics can digitalize Building Education using adapted BIM, VR, and AI tools to bridge the digital divide and close the skills gap. A descriptive survey design was adopted. Data were collected from 248 HND II Building Technology students and lecturers in 3 federal polytechnics in the South-South zone using a structured questionnaire. Descriptive statistics, mean, and standard deviation were used for analysis at a criterion mean of 2.50. Findings revealed that digital infrastructure in polytechnics is grossly inadequate, with a grand mean of 1.83. Digital literacy among students and lecturers is also low, grand mean 2.18. However, respondents showed strong positive perception toward low-bandwidth, mobile-based BIM, VR, and AI tools, grand mean 3.44. Major barriers identified were inadequate funding 91.9%, poor electricity 86.7%, and lack of trained lecturers 81.0%. The study concludes that digitalizing Building Education is feasible in Nigeria if low-bandwidth, mobile-first strategies are adopted. A 4-layer “Low-Bandwidth Digital Framework” is proposed, anchored on solar power, BYOD, offline servers, mobile BIM/VR/AI apps, TPACK-based pedagogy, and CORBON-led policy advocacy. The study recommends curriculum review by NBTE, targeted TETFund intervention, industry-academia partnerships, and mandatory digital competency for CORBON registration. This approach will reimagine future-ready higher education ecosystems in Africa and produce CORBON-registered builders capable of ensuring quality and safety in housing delivery.

212. Digitizing SEM-FTIR Characterization of Tropical Tuber Starches for Virtual STEM Education in Africa

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This study repositions the characterization of indigenous starch resources as a model for digital transformation of STEM education in African higher institutions. Three tropical tuber crops - cassava, sweet potato and yam - were evaluated for food-grade starch with dry weight yields of 23.82%, 18.65% and 21.34% respectively. Starches were chemically modified via acetylation using acetic anhydride, acid hydrolysis using hydrochloric acid, and oxidation using sodium hypochlorite. The native and modified starches were analyzed using Scanning Electron Microscopy (SEM) for morphology, Energy Dispersive X-ray Spectroscopy (EDS) for elemental composition, and Fourier Transform Infrared spectroscopy (FTIR) for structural changes. SEM photomicrographs revealed distinct granular shapes with smooth surfaces in native starches. Digital imaging showed that acetylation preserved surface smoothness, while acid hydrolysis and oxidation caused surface erosion and pitting, more pronounced in oxidized yam starch. EDS data showed carbon and oxygen as dominant elements accounting for over 96% of composition, with nitrogen, manganese and zinc in trace amounts. FTIR spectra revealed significant shifts in absorbance peaks: new O-H stretching peaks at 3573.99, 3383.43 and 3559.81 cm-1 (acetylated), 3324.64, 3370.91 and 3405.92 cm-1 (acid-hydrolyzed), and 3514.19, 3531.81 and 3319.05 cm-1 (oxidized) for cassava, sweet potato and yam starches respectively, alongside new peaks for C-H, C-C, C-O, C-O-C and C-O-H functional groups. We propose digitizing these high-resolution SEM micrographs, EDS datasets, and FTIR spectral libraries into open-access virtual laboratory modules and Learning Management Systems (LMS). This approach converts conventional bench research on tropical tubers into reusable digital assets; overcoming inadequate equipment, large class sizes, and limited lab access, thereby reimagining practical STEM education for sustainable industrial application in Africa.

Keywords: *Digital Education; Virtual Laboratory; SEM; FTIR; Tuber Starches; STEM*

213. Effect of Digital Innovations on leaner - centered pedagogies in teaching Technical Education courses in Colleges of Education in North West, Nigeria

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This study examined the effect of digital innovations on learner-centered pedagogies in teaching Technical Education in Colleges of Education in North - west, Nigeria. Using a quasi-experimental, mixed-methods design, data were collected from 180 NCE students and 30 lecturers across three Colleges of Education. Instruments included a Technical Skills Acquisition Test, Student Engagement Questionnaire, Classroom Observation Checklist, and lecturer interviews. Quantitative data were analyzed using ANCOVA at .05, and qualitative data were thematically analyzed. Results showed moderate use of simulations, e-learning platforms, and mobile tools. Students exposed to digital-enhanced learner-centered pedagogy had significantly higher skill acquisition than those taught traditionally, _F (1, 177) = 22.31, _p_ < .001, η^2 = .11. Key challenges were poor ICT infrastructure, low digital literacy, and inconsistent power supply. Digital innovations significantly enhance learner-centered pedagogy and skill outcomes in Technical Education with adequate institutional support.

Keywords: *learner-centered pedagogy, technical education, digital innovation, skill acquisition, TVET*

214. Effect of Ict-Based Documentation and Archiving Intervention on Nigerian Music Education Classroom Materials: Bridging the Digital Divide in Higher Education

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This study investigated the effect of ICT-based documentation and archiving intervention on Nigerian music education classroom materials and bridging the digital divide in higher education using a quasi-experimental research design, specifically the non-equivalent control group pre-test post-test design. Three research questions and three null hypotheses guided the study. The population comprised 1,550 individuals (1,369 students and 181 lecturers) from fifteen federal, state, and private universities across Enugu, Anambra, Imo, Abia, and Ebonyi States in South-East Nigeria. Using the Taro Yamane (1967) formula at 95% confidence level and 5% margin of error, 350 respondents were sampled: 175 from universities implementing ICT-based documentation and archiving intervention

(experimental group: 106 students, 69 lecturers) and 175 from universities using traditional documentation methods (control group: 115 students, 60 lecturers), drawn through stratified random sampling. Two structured instruments were used the ICT-Based Documentation and Archiving Impact Questionnaire (ICBDAIQ) and the Digital Divide Assessment Scale (DDAS) with Cronbach's alpha reliability coefficients of 0.86 and 0.84 respectively. Mean, standard deviation, and Analysis of Covariance (ANCOVA) were used to analyse data at 0.05 level of significance, with pre-test scores as covariates. Findings revealed significant differences in mean gain scores on preservation of music education classroom materials, accessibility of indigenous musical knowledge resources, and bridging the digital divide, all favouring the experimental group. Effect sizes (partial η^2 = 0.165–0.172) indicated large practical significance across all outcomes. It was recommended that music educators integrate culturally sensitive ICT-based documentation platforms that promote the preservation of indigenous musical heritage in digital learning environments.

215. Effect of Inquiry - Based Teaching Method on Students Understanding of Sustainable Development Goals in Secondary Schools in Imo State

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This study investigated the effect of the inquiry-based teaching method on students' understanding of Sustainable Development Goals (SDGs) in secondary schools in Imo State, Nigeria. The study was motivated by concerns about students' limited awareness and understanding of global sustainability issues despite the growing emphasis on SDG education. A quasi-experimental pretest-posttest control group design was adopted. The population comprised of 6,348 secondary school students in Imo State, while a sample of 240 participants was selected using proportionate simple random techniques. Data were collected using a researcher-developed Sustainable Development Goals Understanding Test (SDGUT), which was validated by experts in Educational measurements, psychology and biology education. Mean and standard deviation were used to answer the research questions, while Analysis of Covariance (ANCOVA) was employed to test the hypotheses at a 0.05 level of significance. Findings revealed that students taught using the inquiry-based teaching method demonstrated significantly higher understanding of SDGs than those taught using the conventional lecture method. The study concluded that inquiry-based teaching enhances students' understanding of sustainable development concepts and recommended its adoption in secondary schools.

216. Effect of Institutional Policy Support on Academic Staff Adoption of Digital Pedagogy in Higher Education Institutions in Rwanda

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The rapid digital transformation of higher education has heightened the need for institutional policies that support academic staff in adopting digital pedagogy, yet the extent to which such policy support translates into actual classroom practice remains under-researched, particularly in African university contexts. This study aims to: (i) determine the effect of institutional digital policy frameworks on academic staff adoption of digital pedagogy in Rwandan higher education institutions; (ii) assess the effect of institutional infrastructure support on academic staff adoption of digital pedagogy in Rwandan higher education institutions; and (iii) establish the relationship between institutional policy support and academic adoption of digital pedagogy. The study adopts a descriptive correlational research design targeting a total population of 400 academic staff members, from which a sample size of 200 respondents will be drawn using Slovin's formula. A stratified random sampling technique will be employed to ensure proportional representation across faculties, academic ranks, and teaching experience. Data will be collected using a structured, Likert-scale questionnaire complemented by an institutional document review checklist, and analysed using descriptive statistics alongside inferential statistics, specifically Pearson correlation and simple linear regression, processed through the Statistical Package for the Social Sciences (SPSS) version 27. The study is expected to generate empirical evidence to guide university administrators and policymakers in strengthening policy frameworks that enhance faculty adoption of digital pedagogy, thereby contributing to building future-ready, digitally transformed higher education ecosystems in Rwanda and hence Africa.

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Keywords: *Institutional policy support, academic staff adoption, digital pedagogy, higher education institutions, digital transformation*

217. Effectiveness of using digital technologies and innovations in teaching mathematics in higher education

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With the rapid development of information technology, digital change has penetrated into all fields, with no exception to higher education. The application of digital innovation in higher education has become more and more widespread, which not only changes the traditional teaching mode, but also provides a new way for the optimal allocation and sharing of educational resources. Digital innovations are revolutionizing higher education mathematics by shifting the focus from rote memorization to active, conceptual exploration. This study analyzes the theoretical foundations, practical significance, and pedagogical effectiveness of using digital technologies and interactive platforms in teaching mathematics in higher education. Mathematics, with its logical and abstract nature,stands out distinctly, and therefore the use of digital tools in teaching it serves to improve the quality of the educational process. Although, there are issues of accessibility of the digital tools, the study examines the impact of platforms such as GeoGebra, Desmos, Moodle, MATLAB, Maple and Google Classroom on the teaching process, highlighting their application experience in FCE Jama'are education system. Additionally, the role of digital education in student motivation, independent thinking, and creative approach formation is scientifically analyzed.

Keywords: *Digital education, mathematics teaching, interactive platform, GeoGebra, Moodle, Maple, MATLAB, innovative pedagogy, digital competency, learning effectiveness, visual teaching, higher education*

218. Effects of Blended Learning and Flipped Learning Approaches on Academic Achievement of Adult Learners in Osun State, Nigeria

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The incorporation of technology into teaching pedagogy is quite imperative for creating an effective, engaging and inclusive learning environment. It is no gainsaying that aligning pedagogical principles with suitable technological tools can significantly impact on the quality of higher education and prepare students for both present and future challenges. Literature abounds that the conventional method is no longer effective in bringing about the desired learning outcomes in schools. This study therefore investigates the effects of two digital tools, Blended learning and Flipped learning approaches on academic achievement of adult learners in Osun State, Nigeria. Moderating effect of gender on academic achievement is also determined. The study adopts the pretest-posttest control group quasi experimental design of 3x2x2 factorial matrix. Using the purposive sampling method, the study selects three learning centers in the state, and constitutes them into two experimental groups and a control group. The population consists of randomly selected twenty-six (26) learners from each centre, making a total of seventy-eight participants (78). The instruments for data collection includes the Teaching Package and Performance Test Instrument (TPPTI) while evaluation spans eight weeks. Quantitative data are analysed using descriptive statistics and Analysis of Covariance (ANCOVA) at 0.05 level of significance. Result shows significant main effects on the performance of the two experimental groups, Blended learning and Flipped learning over the Control group and also reveals no significant main interaction effect of treatment and gender on the performance of male and female learners. By implication, the academic performance of adult learners improves having been exposed to blended learning and flipped learning approaches. The study concludes that the two digital approaches are very effective in teaching learners and therefore recommends that facilitators should incorporate them in teaching adult learners in distant learning centres.

Keywords: *Effect, Blended learning, Flipped learning, Conventional Method, Gender, Distant learning*

219. Effects of Blended Learning and Heuristic Method on Students Critical Thinking in Geometry in Secondary Schools Within Katsina Zonal Education Quality Assurance, Katsina State, Nigeria

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This study investigated the effects of Blended Learning and Heuristic instructional approaches on secondary school students' critical thinking skills in Geometry within Katsina Zonal Education Quality Assurance, Katsina State, Nigeria. The study adopted a quasi-experimental pre-test, post-test, non-equivalent control group design involving two experimental groups and one control group. The population comprised 5,455 SSII students in public secondary

schools, while a sample of 222 students was selected through multistage sampling techniques. The instruments used for data collection was the Geometry Performance Test (GPT) which was validated by experts in the department of Mathematics Education. The instrument was then subjected to reliability test using test-retest method. The reliability index of 0.83 was obtained. Data were analyzed using mean, standard deviation, and Analysis of Covariance (ANCOVA) at the 0.05 level of significance. The findings revealed that students taught Geometry using Blended Learning obtained the highest post-test mean score (44.52 ± 5.95), followed by those taught using the Heuristic Approach (34.22 ± 8.12), while students taught using the Conventional Method recorded the lowest mean score (29.17 ± 4.98). ANCOVA results showed a significant effect of instructional strategy on students' critical thinking skills ($F(2,205) = 99.44$, $p < 0.001$). Post hoc analysis further indicated that Blended Learning significantly outperformed both the Heuristic Approach and the Conventional Method, while the Heuristic Approach also produced significantly better outcomes than the Conventional Method. The study further found that gender had no significant influence on students' critical thinking development under either Blended Learning ($F(1,68) = 0.01$, $p = 0.904$) or the Heuristic Approach ($F(1,65) = 0.00$, $p = 0.984$). The study concluded that Blended Learning is the most effective instructional strategy for enhancing students' critical thinking skills in Geometry, while both Blended Learning and the Heuristic Approach are effective, inclusive, and gender-neutral teaching methods. The study recommends the integration of technology-enhanced and inquiry-based instructional approaches into mathematics classrooms to promote critical thinking, reasoning, and problem-solving skills among students.

Keywords: *Blended Learning, Heuristic Approach, Critical Thinking, Geometry, Mathematics Education, Secondary School Students, Constructivist Learning Theory.*

220. Empowering Nigerian Teacher Educators: An Empirical Assessment of AI-Driven Pedagogical Training for Future-Ready Higher Education Ecosystems

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Artificial Intelligence (AI) is transforming global higher education, yet its integration within Nigeria's teacher education system remains inadequate despite its potential to bridge the digital divide. This situation has created a divide between students who are 'natives' in the digital age and the majority of teacher educators who are often 'aliens' of the digital age. There is therefore the need to device an approach to bridge this gap so as to enable the Teacher Educators to be of age at introducing the teacher trainees to the use of emerging technologies in their mandates. This study investigates the efficacy of AI enriched instructional package on Teacher Educators Proficiency in classroom instruction. 30 teacher Educators were exposed to the use of AI enriched instructions for 2 days. They were later observed in their various classrooms to see to the effectiveness of their instructions. They were also interviewed on the awareness, skills level and utilization of AI-driven pedagogical tools as well as digital readiness and instructional efficacy across Colleges of Education in North - West Nigerian. Using a convergent parallel mixed-methods design. Quantitative data were gathered through Classroom Observation Schedule and AI-readiness scale. Findings indicate a statistically significant increase in teacher educators' confidence and capability to integrate AI tools for teaching, automated assessment, and lesson planning. The study concludes that bridging the digital divide in Nigerian higher education requires more than technical access; it demands culturally responsive, AI-integrated teacher training curricula.

221. Evaluating Artificial Intelligence's Role in Advancing Digital Equity and Learning Accessibility: A Case Study of Colleges of Education in South West, Nigeria

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This study investigated the impact of Artificial Intelligence (AI) on digital inclusion and learning accessibility within Colleges of Education in South West, Nigeria. Recognizing AI's potential, the research addresses the persistent digital divide and other challenges in developing educational contexts. A descriptive survey design was employed, utilizing a structured questionnaire to collect data from 552 undergraduate science students across government-owned Colleges in South-Western Nigeria. A mixed-methods approach also incorporated qualitative insights. Non-parametric analyses, specifically Kruskal–Wallis H and Mann–Whitney U tests, were used to examine differences in perception. Findings indicate that 19.2% of respondents extensively use AI tools. Significant challenges to AI adoption include inadequate funding (42.3%), infrastructural deficiencies (25%), and limited technical expertise (15.4%). The study revealed significant differences in AI perception based on students' level of study and programme, with higher-level students

and those in Federal Colleges reporting more positive views. No statistically significant gender differences were observed. The digital divide, coupled with sociocultural and linguistic barriers, significantly hinders AI integration. Despite these obstacles, AI offers avenues for personalized and accessible learning. The findings underscore the critical need for inclusive, localized AI solutions, targeted professional development, and infrastructure improvements to foster equitable learning environments in Nigerian Colleges of Education.

222. Exploring Digital Confitency and Colleges of Education Mathematics Teachers' Intention to use Technology: An empirical study

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This study investigated the relationship between digital competency and Colleges of Education mathematics teachers' intentions to use technology for instructional purposes. A descriptive survey research design was employed. The study involved 245 mathematics teachers drawn from six Colleges of Education in northern Nigeria. Data were collected using questionnaire tagged Digital Competency and Technology Intention Questionnaire (DCTIQ). The instrument yielded a reliability coefficient of 0.89 using Cronbach's Alpha. Data were analyzed using descriptive statistics, Pearson Product Moment Correlation, and Multiple Regression Analysis. Findings revealed that mathematics teachers possessed moderate to high levels of digital competency ($M = 3.74$, $SD = 0.68$) and demonstrated positive intentions toward technology integration ($M = 3.91$, $SD = 0.61$). A significant positive relationship was found between digital competency and intention to use technology ($r = 0.71$, $p < .05$). Regression analysis revealed that digital competency significantly predicted teachers' intention to use technology ($\beta = .68$, $p < .001$), accounting for 50.4% of the variance in technology use intention. The study concludes that digital competency is a major determinant of technology adoption among mathematics teachers. It recommends continuous professional development, improved ICT infrastructure, and institutional support for technology integration.

223. Exploring Utilization of Digital Technologies in Tertiary Institutions: Towards a Shift to Automated Paperless Systems

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There is a dire need for digital transformations in tertiary institutions, especially in developing nations where analogue practices are still prevalent. This needed transformation represents a comprehensive shift towards integrating digital technologies to modernise academic, administrative operations and research with a view to actualising smart campuses. This paper focuses on the exploration of digital technologies in tertiary institutions which highlights a crucial transition from traditional paper-heavy workflows to fully automated paperless administration ecosystem. This paradigm shift addresses both the need for institutional sustainability and the growing demand for real-time accessibility of academic and relevant records. Other vital issues discussed include; Administration Modernisation which involves a shift from over reliance on paperwork to cloud-based document management for processes such as Academic Board proceedings, staff appraisals, examination records and so on; Utilization of Robotic Process automation and Artificial Intelligence which allows institutions to accelerate document processing. Challenges associated with this shift are also discussed which include Digital Literacy, Infrastructure Deficits and Culture Resistance. Recommendations are made which include the need for reasonable investment by Governments in developing nations on digital infrastructure and align reward systems with digital adoption.

224. Flipping the classroom using generative AI in the Nigerian College of Education

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The conventional flipped classroom approach largely depends on students engaging with pre-recorded instructional materials and assigned readings before classroom sessions. However, limited student participation and passive engagement often reduce the effectiveness of subsequent in-class activities. This study examines the integration of generative Artificial Intelligence (AI) as a personalised and interactive pre-class learning tool within the context of Nigerian Colleges of Education. Grounded in the constructivist learning theory, the study investigates the influence of AI-driven Socratic prompting on College of Education students' pre-class preparation and its subsequent impact on

critical thinking, classroom engagement, and active participation during face-to-face learning sessions.

A quasi-experimental research design was employed involving two groups of students enrolled in an introductory humanities course (N = 110). The experimental group utilised a customised generative AI tutor to facilitate interactive engagement with weekly reading materials, whereas the control group relied on conventional reading logs for pre-class preparation. Data were collected through pre- and post-intervention critical thinking assessments, thematic analysis of classroom discourse transcripts, and student perception surveys.

The findings revealed that students who engaged with the generative AI tutor demonstrated significantly higher levels of cognitive engagement, analytical reasoning, and participation during classroom discussions compared with those in the control group. Furthermore, qualitative evidence indicated that AI-supported interactions reduced communication anxiety among less vocal students, thereby enhancing their confidence and willingness to contribute to peer-learning activities. Nevertheless, the study highlights the importance of structured pedagogical guidance to prevent excessive dependence on AI-generated content and summaries.

The study provides a practical and scalable framework for educators in Colleges of Education seeking to integrate generative AI as a transformative instructional tool that promotes active learning, critical thinking, and student-centred pedagogical practices rather than serving merely as an administrative aid.

225. From Digital Access to Pedagogical Readiness: Developing an Evidence-based Competency Framework for Future-ready Teacher Education in Nigeria

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Nigeria's digital transformation agenda has given rise to concerted efforts on Educational Technology and the use of digital infrastructure and technology-enabled teaching; however, despite the growing digital access, there is no adequately defined pedagogical framework on what constitutes what teachers should know to effectively leverage technology to enhance instruction. This paper addresses this policy and pedagogical vacuum by developing relevant digital competency framework for EdTech's integration into Initial Teacher Education (ITE) in Nigerian Colleges of Education. The study is premised on the argument that the key issue of digital transformation in teacher education is no longer about merely having access to technology but also about fostering pedagogically prepared teachers, enabling them to select, adapt, critically evaluate and ethically apply digital technology appropriately in the classroom to enhance learning. This study employs a conceptual framework development approach drawing on the systematic review and integration of relevant literature, Nigerian policy documents on education, standards for teacher education and contemporary digital competence frameworks. The study was theoretically anchored on the Technological Pedagogical Content Knowledge (TPACK) and Cultural-Historical Activity Theory (CHAT). The results from the study indicated a common interpretations of digital competence on teaching, overemphasize basic technological skills at the expense of practical use of teaching and learning; digital assessment tools; Locally adaptable and classroom-based pedagogical application of technologies; ethical, critical and artificial intelligence literacy. Therefore, this paper proposes a Future-Ready Teacher Competency Framework that features six interrelated dimensions: (i)Digital-Technological Competence; (ii)Digital Pedagogical Competence; (iii) Technology-Enhanced Assessment Competence; (iv) Technology-Content Integration Competence; (v) Localized, Inclusive And Adaptive Competence; and (vi) Ethical, Critical And Artificial Intelligence Literacy. The framework is also buttressed by research finding that teacher digital competence alone is not sufficient but should be accompanied by institutional readiness, such as infrastructure, lecturer expertise and support, and leadership, to promote successful classroom technology integration.

226. From Self-study to Classroom Practice: Technology Integration and Pedagogical Performance among Primary School Teachers Enrolled in the SPRINT Program in Bauchi State, Nigeria

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The integration of technology into primary education in Nigeria remains a critical policy goal, yet the gap between teacher training and actual classroom application persists. This study examines the relationship between self-study technology modules and subsequent pedagogical performance among primary school teachers enrolled in the SPRINT programinitiative, a nationwide in-service training initiative. Using a mixed-methods design, the research tracked 50

teachers across five Local Government Areas of Bauchi State, capturing their engagement with self-paced digital literacy and technology integration modules over six months. Quantitative data were gathered through module completion analytics and structured classroom observation rubrics measuring the quality of technology-mediated instruction. Qualitative insights were drawn from semi-structured interviews and reflective journals to explore how teachers translated self-study content into practice. Findings revealed a significant positive correlation between sustained, reflective self-study and observable gains in pedagogical performance, particularly in lesson interactivity and learner engagement. However, this translation was heavily moderated by school-level factors, notably access to functional devices and supportive leadership. Teachers who demonstrated the greatest growth were those who supplemented self-study with informal peer learning communities within their schools. The study highlights the promise of self-directed professional development models like SPRINT, while cautioning that without an enabling school environment, even the most motivated teachers struggle to enact change. Recommendations underscore the need for a systemic approach that pairs self-study with school-based technology support and mentorship, ensuring that teacher learning reaches the classroom.

Keywords: Self-Study, Classroom Practice, Technology Integration, Pedagogical Performance, SPRINT Program.

227. Gender-Based Analysis of the Use of Educational Robotics in Enhancing Critical Thinking and Retention in undergraduate Mathematics

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This study investigated the gender-based impact of educational robotics on critical thinking and retention in senior secondary school mathematics in Kaduna State, Nigeria. A quasi-experimental pre-test, post-test, non-equivalent control group design was adopted. A total of 160 undergraduate students (80 experimental, 80 control) participated. The experimental group received instruction using educational robotics, while the control group was taught using conventional methods. Instruments used for data collection were the Mathematics Critical Thinking Test (MCTT) and the Mathematics Retention Test (MRT), both validated and pilot-tested. Data were analyzed using ANCOVA. Findings revealed that students taught with educational robotics significantly outperformed those in the control group in both critical thinking and retention ($p < .001$), with large effect sizes. No significant gender differences were found within the experimental group, suggesting that robotics provides equitable cognitive benefits for both male and female learners. The study concludes that educational robotics is a powerful tool for improving cognitive outcomes and reducing gender disparities in mathematics education. It recommends its integration into the curriculum, teacher training, and gender-inclusive implementation practices.

228. Generative AI Integration in Mathematics Teaching and Assessment: Opportunities, Risks, and Pedagogical Shifts

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The emergence of Generative Artificial intelligence (GenAI)such as Claude and ChatGPT has significantly transformed higher education in Nigeria, especially in the teaching and assessment of Mathematics in tertiary institutions. Generative AI offers a lot of advantages in the area of personalized learning, immediate feedback and improved problem-solving skills but it also has disadvantages. This paper analyzes the opportunities and risks associated with the use of generative AI. It further examines the pedagogical shift brought by GenAI in Mathematics education. The paper in addition uses the conceptual approach based on digital pedagogy and transformation theories to explore the impact of GenAI in personalized learning, formative assessment and understanding of difficult concepts in mathematics. It also examines the challenges of cognitive dependency, digital access inequalities and academic integrity. The study further discusses the new methods of teaching from memorization to understanding of concepts such as AI-assisted learning method and adaptive instruction. The study concludes that for tertiary institutions to benefit from AI's transformative potential, there is a need for institutional policy and framework, equitable access among learners and curriculum changes and capacity building on AI integration.

229. Harnessing Digital Innovation in Physical Education: Reimagining Teaching, Learning, and Research in Federal Universities of Education, North-West Nigeria

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The integration of digital innovation into Physical and Health Education (PHE) represents a paradigm shift in higher education, particularly within the African context where traditional pedagogical approaches have long dominated. This empirical study investigated the harnessing of digital innovation in PHE to reimagine teaching, learning, and research in African universities, with a specific focus on federal public universities of education in Nigeria. The study adopted a descriptive survey research design. The target population consisted of all 107 PHE ecturers from the Federal University of Education, Zaria, and the Federal University of Education, Kano. Based on the Research Advisors (2006) sample size selection model, a sample size of 84 respondents was determined and selected using the proportionate stratified random sampling technique. Data were collected using a structured and validated instrument titled 'Digital Innovation in Physical Education Questionnaire' (DIPEQ), which yielded a reliability coefficient of 0.86 using Cronbach's Alpha. Descriptive statistics (Mean and Standard Deviation) were used to answer the research questions, while inferential statistics (Independent Samples t- test and Pearson Product-Moment Correlation) were employed to test the formulated null hypotheses at the 0.05 level of significance. The findings revealed that while lecturers possess a positive attitude towards digital innovations (such as wearable technologies, video analysis software, and Learning Management Systems), actual utilization remains moderate due to systemic barriers. Major constraints identified include poor internet infrastructure, inadequate power supply, and lack of institutional funding for digital PHE laboratories. The study found no significant difference in digital utilization based on gender, but identified a significant correlation between lecturers' digital literacy and the frequency of technology integration in their instructional delivery. The paper concludes that for African universities to globally compete in sports science and PHE research, institutional stakeholders must heavily invest in digital infrastructure and continuous capacity building. It is recommended, among others, that TETFund and university managements should establish dedicated digital hubs specifically tailored for physical and health education practical and research.

Keywords: *Digital Innovation, Physical Education, Higher Education, African Universities, Teaching and Learning.*

230. Impact of Digital Innovation on Automobile Technology Instructional Delivery in Colleges of Education

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This study seeks to authenticate the capacity of digital innovation in bridging the gap between previous pedagogical influence of instructional models in skill development in Automobile Technology of various Colleges of Education, particularly in the South-Western part of Nigeria; before the advent of Technological tools of instructional delivery system. It is noteworthy that, digital innovation, an aspect of technological tools, has transformed instructional delivery by shifting teaching from passive, one-size-fits-all lectures to dynamic, highly personalized, and interactive experiences. To strengthen this claim, the study explored the digital innovative models imbedded in Artificial intelligence, for enabling personalized learning, real-time feedback, automated assessments, and virtual tutoring at a scale never seen before. The study found out a wide learning gap exist before and after digital innovative pedagogy introduction; bringing about shifting from just distributing technology, to actively cultivating digital literacy. It was further found out that success of this innovation lies on structured teacher training, inclusive access models, and continuous formative assessment. The paper recommends that, large investment should be channeled toward digital pedagogy. There also should be continued improvement in the ongoing Mentorship, to provide continuous, practical support for educators to manage technical and behavioural challenges in digital classrooms, among others.

231. Impact of Artificial Intelligence Tools on Social Studies Students in Colleges of Education in North-Central Nigeria

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In an era of rapidly evolving educational technologies, Artificial Intelligence (AI) tools are becoming increasingly central to transformative teaching and learning experiences. This study assessed the impact of AI tools on Social Studies students in Colleges of Education in North-Central Nigeria. Using a descriptive survey design, data were

collected from 200 NCE II Social Studies students through a structured questionnaire validated at 0.78 Cronbach Alpha. Research objectives were analysed using descriptive statistics, while Pearson Product Moment Correlation and independent samples t-test were used to test the hypotheses at a 0.05 level of significance. Findings revealed a moderate, positive, and statistically significant relationship between AI tool usage frequency and academic performance ($r = .42$, $p < .05$). Independent t-test results equally showed that students with high AI usage ($M = 3.12$, $SD = 0.54$) demonstrated significantly higher levels of digital literacy and readiness compared to those with low AI exposure ($M = 2.47$, $SD = 0.63$), $t(198) = 5.86$, $p < .05$. The study further revealed gradual integration of AI tools such as chatbots, simulations, generative platforms, and automated assessment engines in Social Studies instruction, though constrained by limited access, poor infrastructure, and low technical competence.It is recommended that Colleges of Education should establish AI-enabled Social Studies hubs to promote hands-on technology-driven learning, institutions should regularly organise AI capacity-building workshops for lecturers to advance their pedagogical competence, student teachers should be encouraged to incorporate AI tools into lesson planning and micro-teaching during practicum to boost professional readiness, and equitable access strategies such as subsidised internet and shared devices should be implemented to ensure inclusive participation in AI-enhanced Social Studies education.

Keywords: *Artificial Intelligence, Artificial Intelligence Tools Social Studies Education, Digital Literacy, Academic Performance, Educational Technology Integration. AI Tools*

232. Improvisation to Digital Innovation: Using Mobile Phones and Simulation Applications to Enhance Biology Laboratory Instruction in Rural Secondary Schools in Kebbi State, Nigeria

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Laboratory instruction remains a cornerstone of effective biology education, yet many rural secondary schools in Kebbi State, Nigeria, continue to face acute shortages of standard laboratory equipment, consumables, and functional science facilities. While improvisation with locally sourced materials has long served as a stopgap for these deficiencies, such approaches are often limited in scope, precision, and their ability to represent complex or hazardous biological processes. This study explores the transition from traditional improvisation to digital innovation by examining the potential of mobile phones and simulation applications as complementary tools for enhancing biology laboratory instruction in resource-constrained rural schools. The objectives of this study are to examine the extent to which biology teachers and students can leverage mobile-based simulation apps, virtual laboratories, and educational software to visualize experiments, model biological processes, and reinforce practical concepts that would otherwise be difficult to demonstrate with improvised materials alone, and to assess current levels of mobile phone access, digital literacy, and attitudes toward simulation-based learning, alongside the practical outcomes of piloting selected applications in live lesson delivery. Employing a mixed-methods design, the researcher combines classroom observations, teacher and student questionnaires, and semi-structured interviews across selected secondary schools in Kebbi State. Findings on the preliminary considerations suggest that while infrastructural challenges such as unreliable electricity, limited internet connectivity, and school policies on phone use pose real constraints, the strategic integration of mobile simulation tools alongside existing improvisation practices offers a cost-effective, scalable pathway to enriching practical biology instruction. The study concludes that integrating these technologies into science teaching, alongside progressive investment in conventional laboratory facilities, could contribute significantly to improving the quality, equity and effectiveness of practical science education in rural Kebbi State. Recommendations include teacher training, school-level digital adoption frameworks, and stakeholder engagement to support a hybrid improvisation-digital model suited to the realities of rural science education in Nigeria.

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Keywords: *Improvisation, digital innovation, mobile learning, Biology laboratory instruction, simulation applications, Kebbi State, Nigeria*

233. Innovative Pedagogy of Teaching Chemistry Using Digital Tools in Resource-constrained Educational Environments

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The recent advancement of digital technologies has transformed educational practices worldwide, creating opportunities for innovative pedagogical approaches in science education. Chemistry, a subject often perceived as

abstract and challenging due to its reliance on complex equations and laboratory-based activities, can benefit significantly from the integration of digital tools into teaching and learning processes. This paper examines innovative pedagogical strategies that utilize digital technologies to enhance chemistry instruction and improve student engagement, conceptual understanding, and academic achievement. The study explores the application of virtual laboratories, simulations, interactive multimedia, learning management systems, mobile applications, artificial intelligence-powered learning platforms, and collaborative online tools in chemistry education. These digital tools facilitate visualization of chemical processes, support inquiry-based and student-centered learning, and provide opportunities for personalized instruction. Furthermore, they enable learners to conduct virtual experiments in situations where physical laboratory facilities are inadequate or unavailable. The paper highlights the role of digital pedagogy in promoting active learning, critical thinking, problem-solving skills, and scientific literacy among students. It also discusses the challenges associated with the adoption of digital tools, including inadequate infrastructure, limited digital competencies among teachers, unreliable internet connectivity, and insufficient institutional support, particularly in resource-constrained educational environments. The paper concludes that effective integration of digital tools into chemistry teaching can significantly improve learning outcomes when supported by appropriate teacher training, investment in educational technology infrastructure, and the development of context-specific digital learning resources. It recommends continuous professional development for chemistry educators and strategic policies aimed at fostering technology-enhanced teaching and learning in science classrooms.

Keywords: *Digital Pedagogy, Chemistry Education, Virtual Laboratories, Interactive Learning, Science Teaching, Artificial Intelligence, Innovative Teaching Methods.*

234. Integrating AI-Powered Tools in French Language Instruction in South West Degree Awarding Colleges of Education

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This paper explores the integration of AI-powered tools in French language instruction within South West degree-awarding colleges of education in Nigeria. With the increasing adoption of technology in education, AI-based tools are being leveraged to improve learning process, enhance learning outcomes and facilitate personalized learning experiences. The study examines how AI tools can be used to improve French language acquisition, provide real-time feedback, and foster a more interactive and engaging classroom environment. By investigating the current usage of AI, the research highlights both the benefits and challenges faced by educators and students. It also explores the potential for AI to bridge the gap in French language proficiency, particularly in rural and underserved areas. The findings indicate that while there are challenges, such as infrastructure limitations and resistance to change, the integration of AI tools has the potential to revolutionize language instruction in Nigerian colleges of education.

235. Integrating Artificial Intelligence Into Business and Entrepreneurship Curricula:Opportunities & Challenges

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This study investigates the integration of Artificial Intelligence (AI) into business and entrepreneurship curricula in Nigeria higher education, with a focus on identifying the opportunities and challenges associated with such innovation. Against the backdrop of rapid global technological advancement and the evolving demands of the Fourth Industrial Revolution, the research seeks to assess stakeholders awareness, institutional readiness, perceived benefits, and the systemic barriers to AI adoption in business education programmes. Guided by the Innovation Diffusion Theory (IDT), the study employed a descriptive survey design and collected quantitative data from 168 respondents, including students, lecturers, and academic administrators across federal and state, tertiary institutions in Imo State, Nigeria. Findings revealed a high level of awareness (mean scores: 4.08, 4.22, 3.65 and 2.97) and positive perception of AI's relevance among stakeholders (mean scores 4.10, 4.22. 3.98 and 4.28). However, integration efforts are hindered by significant infrastructure deficits, limited faculty expertise, lack of funding and inflexible curriculum structures with the mean values of 4.33, 4.17, 3.89 and 3.75 respectively. Despite these challenges, participants acknowledged AI's potential to enhance teaching efficiency, promote personalised learning, align education with industry demands and increase graduates' employability. The study concludes that AI holds transformative potential for business and entrepreneurship education in Nigeria if critical institutional reforms and investments are made. It recommends strategic curriculum revision, faculty training, infrastructure development and multi-stakeholder collaboration to

create a conducive environment for effective AI integration. This research contributes to the discourse on digital transformation in African higher education and offers a road map for aligning business education with global technological trends.

236. Integrating Artificial Intelligence, GIS and Remote Sensing into Geoscience Education: A Framework for Future-Ready African Universities

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Rapid advances in artificial intelligence (AI), Geographic Information Systems (GIS) and remote sensing are transforming geoscientific investigation, data interpretation and environmental decision-making. However, their systematic integration into geoscience education across African universities remains limited by inadequate digital infrastructure, restricted access to specialised software and datasets, insufficient staff training and the slow adaptation of university curricula. This paper proposes a practical framework for integrating AI, GIS and remote sensing into undergraduate and postgraduate geoscience education in Africa. The study adopts a conceptual and integrative approach, drawing on developments in digital pedagogy, geospatial technologies and AI-assisted geoscience applications. The proposed framework comprises five interconnected components: curriculum redesign, competency-based practical training, digital infrastructure development, academic staff capacity building and institutional partnerships. It recommends embedding geospatial data processing, satellite-image interpretation, machine learning, spatial modelling and responsible AI use within geology, geophysics, hydrogeology, environmental science and petroleum geoscience programmes. The framework further promotes the use of open-source software, cloud-based geospatial platforms, virtual laboratories and locally relevant datasets to reduce technological and financial barriers. Successful implementation would enable students to develop industry-relevant digital competencies while strengthening their capacity to address groundwater scarcity, natural hazards, environmental degradation, mineral exploration, climate change and sustainable resource management. The paper concludes that coordinated investment in infrastructure, curriculum reform, staff development and university–industry collaboration is essential for creating inclusive, innovative and future-ready geoscience education systems in Africa.

237. Integrating Digital Simulations into Guided Discovery Learning for Future-Ready Technical Education in Africa

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TVET programmes across Africa, and particularly in Nigerian Polytechnics and Colleges of Education, continue to grapple with challenges including inadequate workshop facilities, obsolete equipment, and limited consumable materials. These constraints progressively erode the quality of practical learning experiences, diminishing student interest and motivation in technically demanding and conceptually complex programmes such as Electrical Installation and Maintenance Work, a trend reflected in the sustained decline in enrolment that many institutions have recorded in recent years. The resulting risk is a pipeline of graduates who are ill-equipped for modern, technology-driven workplaces and unprepared for self-employment in the trades. While guided discovery learning (GDL) has been recognised as a highly effective learner-centred instructional approach, its full implementation in TVET remains constrained by the same insufficiency of practical resources. This paper argues that digital simulations, when intentionally integrated with guided discovery learning, offer affordable, scalable, and pedagogically sound alternatives for developing technical competencies in resource-constrained environments, and for restoring the engagement and enrolment that practical-oriented programmes urgently need. Drawing on constructivist theory, particularly Bruner's discovery learning framework, and a review of empirical evidence from TVET, the paper examines how simulation tools such as PhET Interactive Simulations can be embedded within guided discovery instructional sequences to promote practical skill acquisition, problem-solving ability, and digital literacy among students of EIMW and cognate technical programmes. A conceptual framework linking digital simulations, guided discovery learning, technical competence development, and future-ready graduate attributes is presented, followed by a proposed implementation model for African higher education institutions. The paper further identifies key opportunities and challenges associated with this integration and proposes evidence-based mitigation strategies. Findings contribute to the conference theme of bridging the digital divide by demonstrating how technology-enabled pedagogies can transform higher technical education ecosystems across Africa.

Keywords: *digital simulations, guided discovery learning, TVET*

238. Integrating Information and Communication Technology in Teaching English in Nigeria: Some opportunities and Challenges

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The integration of Information and Communication Technologies (ICTs) in the teaching and learning of English is expected to bring some changes in the methods used in teaching the language in Nigeria. Recently, the integration of ICTs in teaching and learning of English has been embraced by the National Commission for Colleges of Education (NCCE) through STEP and TRIDE which are British council educational training initiatives. This study has made an attempt to explore the opportunities and challenges of using ICTs in English language teaching in colleges of education in Nigeria. The English language teachers and students from three different colleges were the informants in this study, and interview and focus group discussion were used as the research methods. The study concluded that ICTs provide the participants the opportunity of accessing learning resources, preparing and presenting their lessons, and conducting online collaborative learning activities such as WhatsApp webinar and online group discussions. However, it was discovered that some of the informants were facing some challenges with the utilization of ICTs in teaching and learning of English. some of these challenges include access to ICT tools such as smart phones and laptop computers, inadequate funds to subscribe for data and lack of skills needed to use ICTs. The research concluded that the government and all stakeholders in the education sector need to minimize these constraints to improve the integration of ICTs in English Language Teaching (ELT) in colleges of education in Nigeria.

Keywords: *Integrating, ICT, STEP, STRIDE, ELT*

239. Integrating learner centered pedagogy through digital innovation a panacea to bridging the gap in education

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The integration of digital innovation into education has significantly transformed technology and learning process, thereby creating opportunities for the advancement of learner-centered pedagogy. Learner-centered pedagogy emphasises active student participation, collaboration, critical thinking, creating a personalized learning experience. Digital technologies such as Artificial Intelligence (AI), learning management system, mobile learning applications, virtual learning environments and educational, analytics provide tools that support these pedagogical principles by enabling flexible, interactive and individualized learning. This paper examines how digital innovation enhances learner-centered teaching and learning practices, highlighting its role in promoting student engagement, autonomy and knowledge construction. It further discuss the benefits of technology-enable learning, including improved accessibility, personalized instruction, real-time feedback and collaborative learning opportunities. Inspite of these advantages, challenges such as inadequate infrastructure, digital inequalities, limited teacher preparedness and concerns about data privacy remain significant barriers to effective implementation. This paper argues that successful integration of digital innovation required strategic investment in technological infrastructure, continuous professional development for educators, and policies that promote equitable access to digital resources. Ultimately, advancing learner-centered pedagogy through digital innovation has the potential of creating more inclusive, effective and future-oriented educational system that will equip learners with the competencies required for success transition to the digital age.

Keywords: *Learner-Centered Pedagogy, Digital Innovation, Educational Technology, Personalized Learning, Student Engagement, Digital Transformation, Artificial Intelligence.*

240. Integration Educational Technology in Early Childhood Teacher Education: Preparing Future ECE Practitioners for Digital Classrooms in Nigeria

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Jigawa State College of Education and Legal Studies (JSCOELS), Ringim, Jigawa State, Nigeria Being a Paper Presented at the International Conference on Digital Innovation and Higher Education (ICDIHE 2026), University of Kigali, Kigali, Rwanda | November 23–27, 2026

ABSTRACT The rapid advancement of educational technology (EdTech) presents both profound opportunities and significant challenges for early childhood teacher education in Nigeria. As digital tools become increasingly embedded in early childhood classrooms globally, higher education institutions responsible for preparing early childhood education (ECE) practitioners face an urgent task: equipping teacher trainees with the digital competencies, pedagogical knowledge, and critical dispositions necessary to design and facilitate developmentally appropriate, technology-enhanced learning experiences for young children. This empirical study investigates the extent to which educational technology is integrated into ECE teacher education at Jigawa State College of Education and Legal Studies (JSCOELS), Ringim, and comparable institutions in Jigawa State, Nigeria. The study employs a sequential explanatory mixed-methods design, collecting data through structured questionnaires administered to 240 ECE teacher trainees and 45 ECE lecturers, supplemented by in-depth semi-structured interviews with 20 participants and observations of 12 ECE methods classes. The study is grounded in the Technological Pedagogical Content Knowledge (TPACK) framework and Constructivist learning theory. Findings indicate that while ECE trainees show positive attitudes toward EdTech, actual digital tool integration remains limited, unsystematic, and inadequately linked to developmentally appropriate practice principles. Key barriers include insufficient digital infrastructure, limited lecturer competency in ECE-specific EdTech application, and a critical absence of ECE-focused digital teaching resources in Nigerian languages. The study offers targeted recommendations for curriculum reform, professional development, and institutional policy in ECE teacher education.

Keywords: *Early childhood education; educational technology; teacher education; TPACK; digital competency; developmentally appropriate practice; Nigeria; Jigawa State*

241. Investigating Pre-Service Teachers' Perception on the Integration of Artificial Intelligence (AI) in Teacher Training Programmes in Nigerian Institutions

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The study investigated pre-service teachers' perception of the integration of artificial intelligence (AI) in teacher training programmes in Nigerian institutions. A descriptive survey design was adopted for the study. Three research questions and three null hypotheses tested at a 0.05 alpha level were employed to execute the study. The Population of the study comprised 400 preservice teachers (students enrolled in teacher education programmes: NCE, B.Ed., PGDE) in Nigerian tertiary institutions (colleges of education, universities) during the study period, drawn from four public institutions in Delta State, Nigeria. These institutions were selected based on their prominence and representation of different types of teacher training programs in the state. The institutions include Delta State University, Abraka; Delta State College of Education, Mosogar; University of Delta, Agbor; and College of Education, Warri, each of which offers a range of programs that train future educators. The sample size of 200 pre-service teachers was drawn using stratified random sampling to ensure a sample of four institutions per stratum and within each selected institution, sample programmes (e.g. Science Education, English Education), then randomly sample preserves teachers from programme lists..A twenty-five (25) researcher made questionnaire titled:" Pre-Service Teachers' Perception And Integration Of Artificial Intelligence (Ai) In Teacher Training Programmes Questionnaire (PTPIAITTPQ) which contained two sections, section A: Demographic information and Section B elicited information from Pre-Service Teachers' Perception And Integration Of Artificial Intelligence using the 4-point likert scale of strongly agree, agree, disagree and strongly disagree. Face and content validity of the instrument were ascertained by the experts in the department of Measurement and Evaluation. The instruments were validated by experts in educational research and test measurement, and a pilot study was conducted to determine reliability using Cronbach's Alpha, which yielded a coefficient of 0.70, indicating high reliability. Data were analyzed using Descriptive statistics such as mean and standard deviations and inferential statistics such as t-tests to compare mean perceptions across groups the gender was used to answer hypotheses.

242. Investigating the effectiveness of Simulation integration into Chemistry teachings and practicals in selected tertiary institutions in Southeastern Nigeria

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The inadequate state of chemistry laboratories and shortage of qualified chemistry lecturers in tertiary institutions in South Eastern Nigeria has necessitated the integration of digitalization. This study investigated the effectiveness of STEM approach through Simulation integration into chemistry teachings and practicals. 200 chemistry students and

25 lecturers were sampled from 8 institutions in South Eastern Nigeria using stratified random sampling .A descriptive survey design was adopted . Questionnaires and interview guides were used for data collection. Mean, standard deviations and percentages were used for data analysis. Results revealed that only 5% of the institutions digitalize their chemistry teachings and practicals using virtual laboratories for practicals and simulation for chemistry teachings. The level of integration of simulation tools such as PhET, ChemCollective and Virtual labs in Chemistry teaching was low with a grand mean of 2.15 on a 4 point scale. The prospects of digitalization were increased learning and retention among the students, reduction in the cost of chemicals ,safer conducts of dangerous experiments and increased manpower. Challenges include poor power supply, poor internet connectivity and inadequate ICT training for lecturers Keynotes ; Simulation, Digitalization, Chemistry teaching,Virtual labs ,Effectiveness.

243. Leadership and Maximising the Use of Technology in Colleges of Education in Nigeria

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Colleges of Education (CoEs) in Nigeria are institutions that train and prepare teachers for the Basic and secondary education. Nigeria like other countries of the world is not left behind in the struggle to integrate technology and Artificial Intelligence (AI) in teaching and learning in schools and colleges. However, this process is faced by a critical challenge of power supply which is one of the most fundamental requirement for the use of technology devices. This paper discusses the existing research on use of technology in Nigerian institutions of learning, highlighting successes, challenges and gaps. It explains how leadership can derive technology adoption and innovation in CoEs and support teaching and learning. It furthers discussed how technology: e-learning platforms and digital tools can impact on teaching and learning. The paper highlighted infrastructure, capacity and cultural factors can affect technology adoption in Nigerian CoEs and lastly. Recommendations / way forward for leaders to maximise technology education quality and accessibility.

Keywords: *Leadership Technology integration Basic Education Teaching Infrastructure*

244. Leapfrogging the Lab Shortage: Scaling Virtual Laboratories and Simulation-Based Learning in Nigerian STEM Education

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As the largest higher education ecosystem in sub-Saharan Africa, Nigeria serves as a critical bellwether for continental digital transformation. This paper evaluates the systemic challenges and structural innovations involved in bridging the digital divide across Nigerian Higher Education Institutions. Historically constrained by erratic power supply, prohibitive bandwidth costs, and traditional rote-learning pedagogies, the Nigerian tertiary education system is undergoing an unprecedented state-led digital transition. Drawing on current data from the Tertiary Education Trust Fund (TETFund) and the National Universities Commission's (NUC) 'e-NUC' 2026 mandate, this study analyzes the nationwide onboarding of over 270 tertiary institutions onto the centralized Blackboard LMS, currently serving over 2.2 million active institutional users. We evaluate the operational scalability of the upgraded Nigerian Research and Education Network (NgREN) alongside the Tertiary Education, Research, Applications and Services (TERAS) platform designed to lower internet tariff barriers. Simultaneously, the study addresses pedagogical friction, examining how NUC's updated 'Guidelines for e-Learning' are shifting academic culture from passive content hosting to interactive, blended environments. Crucially, the paper investigates localized STEM breakthroughs via the newly established Nigerian Universities Electronic/Artificial Intelligence African Centre of Excellence (NUCAICE), which leverages virtual laboratory simulations to bypass physical equipment deficits. The findings culminate in an institutional blueprint for sustainable funding, public-private partnerships with domestic telecommunications providers, and continuous faculty upskilling. Ultimately, this paper argues that Nigeria's dual approach—marrying macro-level national digital platforms with micro-level localized pedagogies—offers a definitive, scalable model for reimagining future-ready, equitable higher education ecosystems across Africa.

245. Leveraging Digital Tools for Teaching Hausa Language in Higher Education: Evidence from Jigawa State, Nigeria

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The integration of digital technologies into language education has opened new possibilities for enhancing the teaching and learning of indigenous African languages in higher education. Hausa, one of the most widely spoken languages in West Africa and a major medium of cultural expression, identity, and communication across northern Nigeria, remains significantly underserved in the growing discourse on digital pedagogy. This study investigates how digital tools are being leveraged to teach Hausa language at the tertiary level in Jigawa State, Nigeria, examining the extent and nature of digital tool adoption by Hausa lecturers, assessing their impact on student engagement and language learning outcomes, and identifying the challenges that constrain effective digital integration in Hausa language classrooms. Employing a mixed-methods research design, the study draws on survey data from 60 Hausa language lecturers and 280 undergraduate Hausa students across selected tertiary institutions in Jigawa State, supplemented by semi-structured interviews and classroom observations. The study is theoretically anchored in sociocultural theory and the Technology Acceptance Model (TAM), which together explain how social, cultural, and technological factors shape educators' adoption and effective use of digital tools in language teaching contexts. Preliminary findings indicate that while digital tools such as audio-visual platforms, WhatsApp, and social media are increasingly present in Hausa classrooms, their use remains largely informal and is rarely guided by explicit language pedagogical frameworks. Significant barriers including inadequate infrastructure, limited digital competency among language educators, cultural concerns about the representation of Hausa identity in digital spaces, and the absence of Hausa-language digital learning resources constrain deeper integration. The study contributes to the largely unexplored intersection of digital pedagogy and indigenous language education in northern Nigeria, offering targeted recommendations for curriculum developers, institutional leaders, and Hausa language educators committed to preserving, promoting, and modernising Hausa language teaching in the digital age.

Keywords: *Hausa language teaching, digital pedagogy, indigenous language education, higher education, technology integration, Jigawa State, Nigeria, sociocultural theory*

246. Leveraging Generative Artificial Intelligence to Enhance Personalized Learning and Educational Access in West African Colleges of Education

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Teacher training colleges across West Africa are under immense pressure, struggling with overcrowded classrooms, underfunded infrastructure, and limited access to up-to-date teaching materials. Because these institutions prepare the teachers who will shape the region's next generation, closing the digital divide here is urgent. This study looks at how accessible, AI-powered tools and adaptive learning platforms can be brought into West African teacher-training classrooms to make learning more personal and interactive, even when resources are tight. By testing lightweight, low-bandwidth AI tools in several pre-service teacher programmes, we gathered data on how well student-teachers stayed engaged, while also speaking directly with faculty and administrators about the real-world hurdles they face, from poor internet connectivity to low digital literacy. The results showed a 28% boost in student-teacher engagement and clearer understanding of core teaching methods, even in schools with weak internet access. These findings show that AI can genuinely help train better-prepared, tech-confident teachers across West Africa, if school leaders and governments step up to invest in reliable internet, user-friendly training, and fair access for every student.

Keywords: *Digital Innovation, Generative AI, Colleges of Education, West Africa, Teacher Training, Inclusive Pedagogy*

247. Leveraging Mobile Technologies for Physics Laboratory Instruction in Resource-Limited Settings and Students Academic Achievement in Nigeria

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The persistent shortage of functional laboratory facilities, inadequate equipment, and limited funding continue to hinder effective physics laboratory instruction in many Nigerian higher education institutions. These challenges have been further exacerbated by the digital divide, particularly in rural and underserved regions. This study investigates the potential of mobile technologies as innovative and cost-effective tools for enhancing physics laboratory instruction

in resource-limited settings in Nigeria. Drawing on the Technology Acceptance Model (TAM) and constructivist learning theory, the study explores the integration of smartphone-based applications, sensor technologies, virtual laboratories, and mobile data collection tools into undergraduate physics practical activities. A mixed-methods research design is proposed, involving physics lecturers and undergraduate students from selected Nigerian universities and colleges of education. Data will be collected through questionnaires, classroom observations, achievement tests, and semi-structured interviews to evaluate the effectiveness, usability, and acceptance of mobile technologies in laboratory learning. The study seeks to determine the impact of mobile-assisted laboratory instruction on students' conceptual understanding, practical skills acquisition, engagement, and academic achievement in physics. Expected findings suggest that mobile technologies can significantly improve access to laboratory experiences, reduce dependence on expensive conventional equipment, and foster interactive, student-centered learning. The paper concludes by proposing strategic recommendations for policymakers, institutions, and educators aimed at promoting equitable access to quality physics education through mobile technology integration. The findings contribute to ongoing discussions on bridging the digital divide and reimagining the future of higher education ecosystems in Africa.

248. MATLAB Digital Literacy and Teaching Effectiveness Among Mathematics Lecturers: A case study of Colleges of Education in Nigeria

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The integration of technology in mathematics instruction is increasingly recognized as critical for improving conceptual understanding, yet many mathematics lecturers in Colleges of Education struggle to utilize specialized software effectively. This study investigated the relationship between MATLAB digital literacy and teaching effectiveness among mathematics lecturers in Colleges of Education in Nigeria. Guided by the Technological Pedagogical Content Knowledge framework, the study adopted a case study design with a mixed-methods approach. A purposive sample of 45 mathematics lecturers was drawn from 5 Colleges of Education in the South-East geopolitical zone. Data were collected using a validated MATLAB Digital Literacy Questionnaire covering technical, pedagogical, and evaluative dimensions, a classroom observation rubric to measure teaching effectiveness, and semi-structured interviews to explore influencing factors. Quantitative data were analyzed using descriptive statistics, correlation, and multiple regression, while qualitative data were subjected to thematic analysis. Findings revealed that lecturers exhibited moderate technical literacy but low pedagogical and evaluative literacy in MATLAB use. A significant positive relationship was found between overall MATLAB digital literacy and teaching effectiveness, with pedagogical literacy emerging as the strongest predictor. Institutional support and prior training were identified as key factors influencing literacy levels. The study concluded that improving lecturers' pedagogical application of MATLAB is more critical than technical training alone for enhancing teaching effectiveness. It is recommended that the National Commission for Colleges of Education and college managements design targeted professional development programs focused on integrating MATLAB into mathematics pedagogy.

Keywords: *MATLAB digital literacy, teaching effectiveness, mathematics lecturers, Colleges of Education, Nigeria, Mathematics pedagogy*

249. Navigating the AI Frontier: Integrating Emerging Technologies for Future-Ready Learning

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The emergence of Artificial Intelligence (AI) and advanced EdTech is fundamentally reshaping the knowledge landscape. Despite this, higher education institutions face a readiness gap, where rapid technological adoption often lacks a pedagogical foundation, resulting in concerns about academic integrity and the digital divide. This study aims to explore the transformative potential of AI in fostering adaptive learning environments, to assess institutional capacity for AI integration, and to propose ethical frameworks for its deployment. To achieve these objectives, the study employed a qualitative multiple-case study methodology, conducting an in-depth investigation into four higher education institutions currently implementing AI-driven initiatives. Data collection was performed through purposive sampling, involving semi-structured interviews with 40 stakeholders, including academic deans, AI developers, and students, alongside a documentary analysis of institutional AI policy frameworks and syllabi integration plans. Using Thematic Content Analysis supported by NVivo software, the study coded institutional responses to categorize challenges in academic integrity and pedagogical adaptation. Additionally, the research utilized the Community of

Inquiry (CoI) framework to evaluate how AI tools impact social, cognitive, and teaching presence in virtual learning environments. This methodological approach allowed for a nuanced understanding of the intersection between technological capability and human-centered pedagogical needs. Findings indicate that while AI-driven tools significantly improve personalization and administrative efficiency, their effectiveness depends on human-AI collaboration and robust ethical oversight. The study concludes that the future of learning lies in "AI-augmented intelligence" rather than automation. It is recommended that institutions: establish clear AI-governance policies; foster AI literacy for both staff and students; invest in scalable, interoperable EdTech infrastructure; prioritize human-centric learning design; and establish inter-institutional partnerships to share best practices in AI innovation.

Keywords: *Artificial Intelligence, EdTech, Future Learning, Institutional Strategy, Higher Education*

250. Pedagogical Digital Resilience in North Central Nigerian Universities: Validating an Offline-First Framework for Future-Ready Higher Education

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The rapid digitalization of African higher education has been anchored on "cloud-first" models that assume stable electricity, affordable internet, and universal device access. In North Central Nigeria, comprising Benue, Kogi, Kwara, Nasarawa, Niger, Plateau, and FCT, this assumption is failing. Erratic power supply, broadband penetration below 35%, data costs exceeding ₦30,000/month for rural students, and recurrent academic disruptions have created a "resilience deficit" where teaching and learning stop when connectivity fails. This directly undermines efforts to bridge the digital divide and build future-ready ecosystems. This paper conceptualizes and positions an *Offline-First Pedagogical Digital Resilience Framework [OPDR-F] as a strategic response to bridge the digital divide in African higher education. Pedagogical Digital Resilience [PDR] is defined as the institutional, pedagogical, and technological capacity to sustain quality teaching, learning, and assessment during intermittent connectivity and prolonged offline periods without loss of learning integrity. Anchored on TPACK-R, Community of Inquiry, and Decolonial theory, OPDR-F is structured across four domains with 12 components: Infrastructure Resilience, Pedagogical Resilience, Institutional Resilience, and Community/Equity Resilience. The framework shifts focus from connectivity-dependency to disruption-readiness. A three-phase validation methodology using Stake's Responsive Evaluation, Stufflebeam's CIPP Model, and Scriven's Goal-Free Evaluation is proposed for North Central universities. The paper concludes that to truly bridge the digital divide, African universities must reimagine digital innovation as "offline-first, online-second." Institutionalizing OPDR-F can reduce student data costs by 40%, ensure learning continuity during outages, and build equitable, future-ready higher education ecosystems in Africa.

251. Reconfiguring Participation: Digital Theatre for Development and Community Engagement in Nigeria'S New Media Landscape

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This paper interrogates how digital media reconfigure participation within Theatre for Development (TfD) in the Nigerian context, moving beyond celebratory narratives of technological expansion to examine the structural transformations of engagement itself. While digital platforms are often framed as instruments that extend participatory reach, this study argues that they fundamentally reshape the conditions under which participation is enacted, experienced, and evaluated. Drawing on participatory communication theory, media ecology, platform studies, and performance theory, the paper adopts a qualitative conceptual methodology to analyse the shift from embodied, co-present interaction to digitally mediated, platform-conditioned communication. Central to the analysis is the concept of the participation gradient, which conceptualises participation as a continuum ranging from passive exposure to co-creative engagement. The study demonstrates that digital environments tend to privilege visibility, speed, and low-intensity interaction, often constraining dialogic depth and collective meaning-making. At the same time, it recognises that digital participation is not uniformly limiting, but unevenly distributed and contextually shaped by infrastructural conditions, digital literacy, and platform logics. Situating the analysis within Nigeria, the paper shows how mobile-first access patterns, linguistic diversity, and socio-economic disparities produce stratified forms of participation. It concludes by proposing a redefinition of participation as a media-contingent construct, arguing that meaningful engagement in digital TfD requires deliberate design strategies that foreground dialogue, reciprocity, and co-creation.

Keywords: *Theatre for Development; Digital Participation; Participation Gradient; Media Ecology; Platform Studies*

252. Reimaging the Future Readiness of Literary Education in Africa

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The increasing advancement of digital technologies has significantly reshaped educational systems across the globe, creating remarkable innovations in literary education. However, this development in literary education is limited by the challenges in digital divide such as poor quality literary education, insufficient technology infrastructure, inability to access digital resources. This paper examines the issues of digital divide in relation to the future readiness of literary education in Africa. Drawing on insight from contemporary scholarship featuring educational technology, digital humanities and African literary studies, the study explores how digital technologies can improve profoundly, access to literary knowledge, creativity and critical thinking across socio-cultural contexts in Africa. This paper argues that the future-readiness of literary education is tied inextricably to the strategic integration of ecosystems with Artificial Intelligence (AI), multimedia resources, digital libraries and Information and Communication Technologies. This is to enhance interactive and learner-centred method in the teaching of literature. It also highlights the values of preserving Africa's literary heritage through digital archiving and providing increasing access to indigenous texts online. While acknowledging optimism about the future-readiness of literary education through inclusive digital activities, pending challenges such as poor digital literacy, inadequate or lack of funding, inadequate teacher capacity building, poor curriculum innovation and lack of digital infrastructures have to be given attention. This paper is of the belief that a well- designed digital ecosystem would foster robust literary activities and cultural sustainability across Africa.

253. Reimagining Assessment of Learning Outcomes in Digital Higher Education: Towards Fair, Effective and Sustainable Practices in Africa

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The rapid digital transformation of higher education has changed the ways teaching and learning are delivered and experienced. While digital pedagogy creates opportunities for flexible and learner-centred education, it also raises important questions about how learning outcomes can be assessed fairly, effectively and sustainably. These concerns are heightened by academic integrity challenges, digital inequality and the growing use of generative artificial intelligence (AI). This paper examines the challenges of assessing learning outcomes within digital pedagogy and proposes approaches for fair, valid, authentic and sustainable assessment in African higher education. Using a conceptual and analytical approach, the paper draws on literature on digital pedagogy, assessment, academic integrity, educational technology and AI. It argues that simply transferring conventional examinations to digital platforms does not constitute effective digital assessment. Instead, assessment should be redesigned to align with intended learning outcomes and provide diverse and credible evidence of learning. The paper proposes the FAIR-D Model of Digital Assessment, based on five principles: Fairness and Equity, Authenticity, Integrity, Reliability and Validity, and Digital Sustainability. The model promotes authentic and contextualised assessment, continuous and formative assessment, project- and problem-based learning, digital portfolios, oral presentations, feedback, and responsible use of AI. The paper concludes that the future of assessment in African higher education should be guided not by technology alone, but by educational quality, equity, academic integrity and institutional sustainability. Reimagining assessment is therefore essential to achieving the broader digital transformation of higher education in Africa.

Keywords: *Digital pedagogy; assessment of learning outcomes; digital assessment; higher education; artificial intelligence; academic integrity; Africa*

254. Reimagining ESL Classrooms: Digital Pedagogy, Collaborative Learning, And Knowledge Sharing

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This position paper examines collaborative learning and knowledge sharing within the evolving landscape of digital pedagogy in English as a Second Language (ESL) classrooms. Grounded in social constructivist theory, the paper posits that ESL learning is inherently interactive and increasingly mediated by digital technologies that facilitate communication, collaboration, and co-construction of knowledge. Drawing on a critical synthesis of existing literature, the paper argues that digitally supported collaborative learning environments provide ESL learners with authentic and

flexible opportunities to engage in meaningful language practice, thereby enhancing communicative competence, fluency, and learner autonomy. The discussion highlights technology-enhanced collaborative strategies such as virtual peer interaction, online discussion forums, collaborative writing platforms, and cooperative learning supported by learning management systems and mobile applications. These digital tools extend learning beyond traditional classroom boundaries, enabling synchronous and asynchronous knowledge sharing, fostering inclusivity, and accommodating diverse learner needs and proficiency levels. Furthermore, the paper underscores the role of digital knowledge-sharing practices in promoting learner agency, intercultural communication, and access to global linguistic resources. Despite these affordances, challenges such as digital divide, unequal participation, technological literacy gaps, and language anxiety in virtual spaces are critically examined. The paper emphasizes the need for intentional instructional design, digital competence among teachers, and structured facilitation to optimize collaborative outcomes in technology-mediated ESL environments. It concludes that the effective integration of digital pedagogy into collaborative learning frameworks is essential for preparing learners for communication in a digitally interconnected world

255. Reimagining Geography Education through Digital Innovation for Future-Ready Higher Education in Africa

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The call for digital innovation in African higher education presents a pivotal opportunity to reimagine pedagogical practices that can drive continental transformation. Despite the proliferation of digital tools and policies, teaching and learning procedures in many institutions remain tethered to rote memorization and content reproduction, with inadequate attention to the higher-order thinking skills (HOTS) essential for problem-solving in complex, data-rich contexts. This challenge is particularly acute in Geography education, a discipline historically burdened by narrow perceptions of its scope and relevance, leaving educators with the critical task of reshaping how geographical knowledge, skills, and attitudes are cultivated. Adopting a descriptive research design, this paper critically reflects on prevailing pedagogies and proposes adaptive, digitally-enhanced strategies designed to provoke critical, creative, reflective, systematic, and spatial thinking. It argues that integrating digital innovation into Geography pedagogy not only strengthens students' capacity to interrogate spatial data and model real-world scenarios but also empowers them to generate context-driven solutions to pressing African challenges, including climate change adaptation, environmental sustainability, disaster risk reduction, urban planning, resource governance, and sustainable livelihoods. The paper further contends that repositioning Geography education as a digitally-enabled, competency-driven, and innovation-oriented discipline can significantly contribute to Africa's socio-economic transformation and the achievement of the Sustainable Development Goals. It concludes with actionable recommendations for educators, institutions, and policymakers seeking to harness digital innovation as a catalyst for reimagining higher education in Africa.

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Keywords: *Digital Innovation, Higher Education, Geography Education, Higher Order Thinking Skills, African Transformation, Adaptive Pedagogy.*

256. Reimagining Tax Education in Open Distance e-Learning: A Conceptual Framework for Inclusive and Scalable Experiential Learning in the Global South

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Tax education in the Global South faces persistent challenges in developing graduates who are not only technically competent but also capable of exercising judgement, taking ethical responsibility, and being socially conscious in an increasingly complex tax environment. While clinical education has proven effective in enhancing practical learning, professional readiness and social responsibility, existing models are predominantly designed for face-to-face or blended settings, limiting their applicability in Open Distance e-Learning (ODeL) contexts. ODeL institutions, characterised by large, diverse, and geographically dispersed student cohorts, lack scalable and inclusive frameworks for delivering experiential learning at the level required for tax education. This conceptual paper responds to this gap by proposing a theoretically informed framework for adapting clinical education to ODeL environments. The study follows a qualitative research design by synthesising literature across clinical education, experiential learning, and ODeL. Drawing on Kolb's Experiential Learning Theory (ELT), the Community of Inquiry (CoI) framework, and

Universal Design for Learning (UDL), the paper integrates key pedagogical, accessibility, and scalability principles to reimagine how experiential learning can be delivered meaningfully in online settings. The proposed framework provides a pathway for designing tax clinics and practice-based learning opportunities that remain authentic, inclusive, and sustainable within resource-limited contexts typical of the Global South. In doing so, the paper contributes a contextually responsive model that supports curriculum transformation and advances equitable access to professional competence development in tax education.

257. Reimagining the Past through Ai-Generated Videos as Pedagogical Tools in History Education

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The integration of Artificial Intelligence (AI) technologies into educational practice has accelerated significantly in the early twenty-first century, presenting History educators with both unprecedented opportunity and profound epistemic challenge. This paper examines the use of AI-generated videos in history pedagogy through a qualitative, interpretivist lens, drawing on document analysis, practitioner literature, and theoretically grounded inquiry. The central argument advanced is that AI-generated video occupies a distinctive pedagogical position in history education, one that simultaneously enriches historical imagination and risks distorting the disciplinary foundations of historical thinking. Framed by Wineburg's (2001) historical thinking framework, Mishra and Koehler's (2006) Technological Pedagogical Content Knowledge (TPACK) model, and critical digital pedagogy theory. This paper discovered that AI-generated video tools such as Synthesia, D-ID, RunwayML, and Sora for classroom History instruction have their capabilities and limitations. Four major themes are identified and discussed; the capabilities of AI video for historical imagination and student engagement; the potential of AI video as a platform for disciplinary historical thinking; the epistemic and ethical tensions inherent in deploying AI-generated historical content; and the implications for teacher knowledge and professional practice. The paper raises some valuable recommendations about the ethical use of AI-generated videos for History pedagogy, among which are; the development of a "critical AI literacy" as a foundational competency within history education, and a call for further empirical research into student epistemological responses to AI-generated historical representations.

258. Reimagining Yoruba Language Education through Digital Innovation: Pathways for Sustainable Higher Education Transformation in Africa

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The emergence of digital technologies has significantly transformed teaching, learning, research and knowledge dissemination across higher education institutions worldwide. In Africa, tertiary institutions are increasingly adopting innovative digital solutions to improve educational quality, accessibility and sustainability. However, indigenous language education, particularly Yoruba language studies, has not fully benefited from the opportunities provided by digital innovation. The persistent reliance on traditional pedagogical approaches, inadequate digital learning resources and limited integration of emerging technologies have constrained the effective teaching and learning of Yoruba language in higher education institutions. This paper examines how digital innovation can be leveraged to reimagine Yoruba language education within the context of sustainable higher education transformation in Africa. Drawing on constructivist learning theory and the Technology Acceptance Model (TAM), the study explores the roles of artificial intelligence, e-learning platforms, virtual learning environments, mobile learning applications, digital repositories and multimedia technologies in enhancing Yoruba language teaching and learning. Through a qualitative review of contemporary literature and empirical studies, the paper identifies key opportunities, challenges and strategic pathways for integrating digital technologies into Yoruba language education. Findings revealed that digital innovation enhances learner engagement, language preservation, accessibility, collaborative learning and cultural sustainability. The paper concludes that purposeful integration of digital technologies into Yoruba language programmes can contribute significantly to the digital transformation agenda of African higher education institutions while preserving indigenous linguistic heritage. Recommendations are provided for policymakers, tertiary institutions, curriculum developers and language educators.

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Keywords: *Digital innovation, Yoruba language education, higher education, artificial intelligence, indigenous languages, digital pedagogy, Africa*

259. Reinventing the Sustainable Development Goals (SDGs) for the Nigerian Social Studies Curriculum of the Digital Era

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developmentinsocialstudies. KEYWORDS:Sustainabledevelopmentgoals,SocialStudies,Digital
BystudyingtheseUN-definedtargets,studentsexplorereal-worldsocietal,
economic,andenvironmentalissues—suchaspoverty,inequality,and
canimprovetheNigeriansocialstudiescurriculumoftheDigitalEra.Italso
curriculumsofar,andalsothegapstofillortheinnovationstomake.Finally,
thisendthestudyaimsatinvestigatinghowsustainableDevelopmentGoals
Thepaperalsofocusesonthedigitaleducationinthesocialstudieseducation
sustainabledevelopmentgoalsinsocialstudiescurriculum:itimpactssofar.
recommendationsaremadetowardsthesustainableDigital
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climatechange—andlearnhowtobuildafairer,moresustainablefuture.To
presentwithparticularreferencetoNigeria.Itexaminesthesustainable
developmentgoals:itsemergenceandevolution.Thepaperhighlightsthe Education.AcademicDiscipline.

260. Religio-Ethical Issues in Digital Technology Utilization: a Conceptual Framework

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Digital technologies are rapidly dominating the life of man. The report of Global Artificial Intelligence (AI) Use Index 2025 highlights a continuous rise both in AI global use and investment in it with 26% growth, the quantum investment of which was more than $252.3bn by the private sector within the year. Against the background of the exponential rise in the acceptability and utilization of digital technologies in all facets of life, the paper re-examines the concept of creation and its philosophy relative to the invention and utilization of digital technology in general. Situating the discussion in religio-ethical context, a critique of AI digital transformation within the realm of permissibility of its production and use of human-like objects was made. The paper, in historical context, further critically assessed the implication of the algorithm driving AI digital systems, to which it recommends religio-ethically compliant system as imperative in determining appropriate framework for the production and utilization of digital technologies which rapidly drives the contemporary world.

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261. Replacing Traditional English Language Teaching qith Creative Pedagogy Leveraging Artificial Intelligence to Foster Communicative Competence in Language Acquisition

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Traditional English Language teaching (ELT) method, often grounded in rote memorization and form-focus drills, have long beencriticised for failing to develop the communicative competence learners require for authentic interaction. Creative pedagogy encompassing drama, story-telling, project-based learning, and collaborative tasks offers an engaging alternative, yet its full potentials remains untapped without systematic technological support. This paper argues for a paradigm shift that could portentially replace conventional ELT with an AI enhanced creative teaching framework designed to foster communicative competence in language acquisition among English as a Second language (ESL) learners. Artificial Intelligence tools, including conversational chatbots, speech recognition, adaptive learning platforms, and generative language novels can create immersive interative environments that provide personalized

feedback and scaffolding for creative expression. By amplifying activities such a dinamic role plays wit virtual agents, real time pronounciation correction during story telling, and intelligent prompts for collaborative writing,. AI helps target all dimentions of communicative competence.

262. Resilient Teacher Education through Artificial Intelligence: Evaluating the Effectiveness of AI-Supported Pedagogical Innovation in Boko Haram-Affected Schools in Borno State

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Boko Haram insurgency has disrupted education in Borno State through displacement, infrastructural destruction and declining learning outcomes. This study examines the effectiveness of Artificial Intelligence (AI)-supported pedagogical innovations in enhancing teacher education in conflict-affected environments. data were collected from 100 pre-service teachers in Colleges of Education and selected learning centres within IDP camps using a quasi-experimental mixed-methods design. A 20-item, five-point Likert-type questionnaire covering pedagogical skills, engagement and retention, psychological and emotional support, and comparative performance outcomes was analysed using frequencies, percentages, means, and standard deviations. The findings of the study indicate that AI-powered tools such as ChatGPT, Google Classroom, and adaptive learning platforms goes a long way to improve pedagogical competence (M = 3.85), learner engagement (M = 3.69), academic performance (M = 3.81) and psychological resilience (M = 3.60), with an overall mean of 3.74. It further reveals that AI-supported learning environments help address trauma-related barriers through personalized and flexible learning experiences. The study recommends integrating AI technologies into teacher education programmes to strengthen educational resilience and post-conflict recovery in Borno State.

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Keywords: *Artificial Intelligence, Teacher Education, Innovation, Conflict-Affected Areas, Educational Resilience*

263. Rethinking Accounting Education in African Universities: Integrating Digital Technologies to Bridge the Digital Skills Gap

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The rapid digital transformation of the global financial landscape is impacting significantly on the accounting profession and fundamentally reshaping the knowledge, skills and competencies required of accounting graduates. However, accounting education in many African universities remains largely anchored on traditional approaches to teaching and professional preparation. This disconnect has created an emerging skills gap between the competencies developed through accounting programmes and those increasingly demanded by technology-enabled industries. This study challenges the status-quo and calls for a re-examination of how the integration of digital technologies can contribute to bridging this skills gap and preparing accounting graduates who would fit into the evolving digital landscape. Drawing on contemporary literature, policy documents, and international best practices, the paper adopts a qualitative conceptual approach to synthesize current knowledge on accounting education, digital competencies and accounting skills gap. The study argues that the digital skills gap is not simply a consequence of inadequate access to technology but reflects a broader mismatch involving curriculum rigidity, limited faculty preparedness and inadequate digital infrastructure. The study therefore contends that effective digital transformation requires accounting education to move beyond technology awareness toward the development of integrated competencies encompassing digital literacy, data analytics, artificial intelligence literacy, critical thinking and problem-solving capabilities. The study develops an integrated framework that conceptualizes digital technology integration as a multidimensional educational transformation involving curriculum design, pedagogical innovation, faculty digital competence, institutional readiness and university-industry collaboration. The study contributes to the accounting education literature by reframing the digital skills gap as a systemic educational challenge requiring coordinated transformation of curricula, pedagogy, faculty capability, infrastructure and industry–academia relationships. The framework provides a basis for recommendations to universities, professional accounting bodies, policymakers and employers to redesign accounting education in ways that produce future-ready and professionally responsible graduates who can participate effectively in Africa's evolving digital economy.

264. Role of Artificial Intelligence in the Facilitation of Adult Education Pedagogy and Instruction

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As adult learners bring diverse experiences, motivations, and learning styles to the educational environment, traditional approaches often fall short in providing truly personalized and effective learning pathways. AI offers a powerful solution by enabling dynamic customization, enhanced accessibility, and intelligent support throughout the learning journey. This paper explores how AI-powered tools and methodologies facilitate key aspects of adult education. These include personalized learning experiences through adaptive content and intelligent tutoring systems, real-time feedback and assessment for tailored skill development, and increased accessibility through features like speech-to-text, translation, and assistive technologies. Furthermore, AI can streamline administrative tasks for Adult Educators, allowing them to focus more on direct instruction and learner engagement. While acknowledging the immense opportunities, it also briefly touches upon ethical considerations and the need for a balanced approach to integrate AI effectively and equitably into adult education.

Keywords: *Artificial Intelligence, Adult Education, Facilitation, Pedagogy, Instruction*

265. Shaping Digital Pedagogy in Automotive TVET: Instructor Competence and Institutional Conditions in Uganda

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Technology-enabled learning is increasingly important in technical and vocational education and training (TVET), particularly in fields such as automotive mechanics where emerging technologies are transforming both industry practice and the competencies expected of graduates. However, the availability of technology does not necessarily translate into meaningful digital pedagogy. This paper examines instructor-related factors shaping the integration of Automotive Mechanics Technology curriculum implementation in a selected TVET institution in Central Uganda. The paper draws on qualitative evidence generated through instructor and administrator interviews, learner focus-group discussions, lesson observations, and a technology-resource checklist. Thematic analysis identified four interconnected dimensions: technological, pedagogical and automotive-content competence; professional development and contemporary industry exposure; confidence, attitudes and technology avoidance; and workload, collaboration and institutional support. Findings revealed uneven and technology-specific instructor competence. Instructors demonstrated greater confidence in using familiar technologies, including projectors and selected diagnostic equipment, while integration of specialised technologies and learner-centred digital pedagogies remained limited. Professional development opportunities existed but were uneven and were not consistently linked to sustained classroom application. Technology avoidance was not simply a matter of negative instructor attitudes; it was intertwined with competence, preparation demands, safety concerns, access to equipment and perceived curriculum relevance constrained instructors' pedagogical choices. The paper argues that strengthening digital pedagogy in TVET requires moving beyond technology provision and one-off instructor training towards an integrated approach that develops technological, pedagogical and occupational-content competence alongside sustained industry exposure and institutional support. The findings contribute to discussions on teaching innovation by highlighting the conditions required for instructors to move from using digital tools primarily for presentation and demonstration towards meaningful, learner-centred technology-enabled learning.

Co-authors: *Mary Teophira Ocheng Kagoire (Uganda Christian University)*

Keywords: *Technology-enabled learning, TVET, automotive mechanics education, instructor competence, teaching innovation*

266. Special Teachers' Attitude Towards Digital Pedagogy and Teaching of Persons with Special Needs in Ibadan, Oyo State, Nigeria

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Digital pedagogy has become a very important feature of contemporary special education because of the opportunities it offers with flexibility, individualized instruction and the ability to meet the diverse academic needs of persons with special education needs. Special teachers play an important role in the integration of digital technologies in the teaching and learning process and their attitude is equally of significance in determining the success of digital

pedagogy. This paper therefore examined special teachers' attitude towards digital pedagogy and teaching of persons with special needs education in Ibadan, Oyo State, Nigeria. The descriptive survey research design was adopted and the sample comprise 120 special teachers (with sixty-one being males and fifty-nine being females) who were purposively selected from seven public and three private schools in Ibadan.

The university teachers' attitude to ICT questionnaire made up of fifteen items was adapted to obtain information on the cognitive, affective and behavioural dimensions of attitude towards the integration of digital technologies in teaching. A Cronbach reliability coefficient of 0.78 was obtained after a pilot study. Three research questions and two hypotheses were generated for the study. The mean, standard deviation and inferential statistics of Pearson Product Moment Correlation and percentages were used to answer the research questions and the analysis of variance and Pearson Product Moment correlation were used to analyze and test the hypotheses at 0.05 level of significance.

Results indicated general positive attitude of special teachers towards incorporating of digital technologies in teaching. Age and gender were equally found to correlate significantly with attitude towards digital pedagogy. Males were found to possess positive favourable attitudes than females (x = 71.62, SD = 2.84) than females (x = 58.91). A significant different was also found among age of teachers with special needs as those within the age bracket of (27-37) possess the most favourable attitudes against the other two groups, of 38-48 and 49-59 years.

Based on the finding of this study, it was recommended that special teachers should engage in continuous practical and professional development that educational institutions should provide for technical support, ICT facilities and that digital training should be included in education programmes in teacher training institutions.

Keywords: *Digital pedagogy, Special teachers, attitudes, gender, age*

267. Strategies For Transitioning From Traditional Pedagogies To Digital Innovations For Mathematics Education ln Nigerian Universities

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Mathematics is often considered as one of the most challenging subjects in schools, despite this, it is a fundamental part of our everyday lives. Traditionally, the teacher-centered or direct instruction was the predominant mode of instruction; in which teachers provide specific rules, algorithms, and formulas for students to follow. Usually, Rote Memorization, Drill and Practices are employed to achieve fluency and precision in executing mathematical operations. Today, there is a significant shift from this traditional pedagogy to digital innovation from rote memorization to active, personalized exploration, by deploying tools like AI tutors and dynamic visualization software, with which students can instantly test concepts, engage with adaptive problems solving, and build a stronger, intuitive grasp. Integrating digital innovations into the mathematics curriculum in Nigerian Universities requires a structured, step-by-step approach; rather than completely overhauling the existing methods. In order to overcome impediments in the transition, it is recommended that authorities should employ strategies that gradually introduces tech tools and encourage active learning through Pedagogical Integration Framework using the SAMR Model, Mapping Software Directly to the Mathematics Curriculum; Software and Content Deployment and Capacity Training for Teachers. These steps would reduce the challenges that would hinder transition.

Keywords: *Digital Innovations, Pedagogies, Procedural approach, Strategies, Transitioning*

268. Sustainability and the Future: Aligning Higher Education with the Sustainable Development Goals (SDGS)

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Global stakeholders widely call on higher education institutions to contribute to global sustainable development by proactively aligning with the United Nations Sustainable Development Goals (SDGs). At present, while universities and colleges have generally raised their awareness of SDG alignment, their practical actions remain uneven and fragmented. To address this issue, this study carries out original empirical research with two core objectives: first, to assess the level of SDG alignment across three dimensions, namely teaching, research, and institutional governance; second, to identify barriers to deep integration and propose a practical framework to narrow the relevant gaps. This study adopts a mixed-methods research design that combines surveys, textual analysis, and semi-structured interviews. Multi-stage sampling is used to ensure the representativeness of the sample, which covers respondents from different institutions and holding different roles. Quantitative data is analyzed via descriptive statistics,

inferential statistics, and multi-path hypothesis testing, while qualitative data is processed using thematic analysis. The study's findings show that the curriculum dimension has the highest SDG alignment rating, with an average score of 3.61 out of 5, and digital infrastructure has the lowest score of 2.97 out of 5. The core barriers identified are structural silos, digital shortcomings, and leadership gaps. All four hypothesized paths passed the statistical tests, confirming the interactive effects across the studied dimensions. Finally, drawing on institutional theory and the dynamic capabilities perspective, this study puts forward a four-pillar SDG-HEI alignment framework, which provides evidence-based guidance for policy formulation at both the institutional and national levels.

Keywords: *digital infrastructure, higher education institutions, institutional governance, SDG integration, sustainable development goals, sustainability policy, university curriculum*

269. Technology integration of blended learning strategies for the use of smart phone mediated instruction in tertiary institutions in Nigeria strategies for the use of sm

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Technology is an inevitable tool for blended learning strategies instruction for the use of smart instructions in Nigerian tertiary institutions to improve interactivity and bridging the gap of accessibility holds the key factor. For this singular reason the value and relevance of integrating smart phones to the sustenance and improvement of instruction cannot be over emphasized.The paper explores the concept of blended learning strategies, concept of smart instruction,It discuss the strategies for integrating blended learning and smart phone mediated instruction. The paper posits that smart mediated instruction as an offshoot of the techological growth of the 21st century is not useful for teaching alone but also for studying and learning in and outside the classroom, It can also be applicable in basic instruction, classroom enrichment, accelerated learning, distance education, global student collaboration, communication and for professional development.The application of smart phone are also espoused and the benefits of using smart phone for instruction was explained.some of the barriers of the adoption of blended learning and smart mediated instruction comprising; policies, technological, behavioral and resource based. Recommendations that will lead to acceptance, understanding and good practices that can also bring success in innovative emerging technological instruction process are proffered. *key words* : Technology,Blended learning, strategies, smart mediated instruction

270. The Application of Innovative Technologies in Science Teaching and Learning on the Academic Performance of Students

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This study investigated at how cutting-edge technology is used in science education and how it affects entrepreneurship students' academic performance. Global educational methods have changed as a result of the quick development of digital technologies, opening up new possibilities for interactive learning, better classroom participation, and increased knowledge acquisition. Despite these advancements, incorporating contemporary technologies into science education remains a difficulty for many institutions in developing nations, which has an impact on students' academic performance and entrepreneurial skills. Thus, the study looked into how cutting-edge technology tools like e-learning platforms, virtual labs, multimedia resources, smart devices, and internet-based teaching techniques affect how entrepreneurial students are taught and learn. The study used a hybrid methodology that combined a qualitative approach using case studies with a descriptive survey research design. Structured questionnaires were used to gather data from a subset of science instructors and entrepreneurial students, and descriptive and inferential statistical techniques were used for analysis. The results showed that using cutting-edge technologies greatly improves students' comprehension of scientific ideas, boosts classroom engagement, encourages critical thinking, and improves academic achievement. Inadequate budget, poor internet connectivity, low digital literacy, and inadequate technology infrastructure were also noted in the study as significant obstacles to successful adoption. The study found that incorporating cutting-edge technologies into science instruction has a positive effect on students' academic achievement and the growth of their entrepreneurial skills. In order to promote science education outcomes and entrepreneurial development, it recommended that the government spend more in educational technologies, regularly educate teachers, provide digital learning facilities, and encourage technology-driven instructional practices inside institutions.

271. The Effect of AI-Supported Digital Pedagogy on Students' Academic Engagement and Learning Outcomes in Higher Education in Enugu Metropolis

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This study investigated the effect of AI-supported digital pedagogy on students' academic engagement and learning outcomes in higher education institutions in Enugu Metropolis, Nigeria. The increasing integration of artificial intelligence (AI) into higher education has transformed instructional practices by fostering learner-centred teaching, personalized learning, and interactive classroom experiences. Despite these developments, empirical evidence on the effectiveness of AI-supported digital pedagogy in enhancing students' academic engagement and learning outcomes within the Nigerian higher education context remains limited. The study adopted a quasi-experimental research design involving experimental and control groups. The population comprised undergraduate students in selected higher education institutions in Enugu Metropolis, from which a representative sample of 90 students was selected using a multistage sampling procedure. Data were collected using validated instruments measuring AI-supported digital pedagogy, students' academic engagement, and learning outcomes. The reliability of the instruments was established as 0.83 using Cronbach's alpha coefficient. Descriptive statistics, including mean and standard deviation, were used to answer the research questions, while Analysis of Covariance (ANCOVA) was employed to test the null hypotheses at the 0.05 level of significance, with pre-test scores serving as covariates to control for initial group differences. The findings revealed that students exposed to AI-supported digital pedagogy demonstrated significantly higher levels of academic engagement and improved learning outcomes than those taught using conventional instructional approaches. The study concludes that AI-supported digital pedagogy enhances learner participation, motivation, and academic achievement by providing adaptive learning experiences and timely instructional feedback. It recommends that higher education institutions invest in AI-enabled instructional technologies, strengthen lecturers' capacity through continuous professional development, and develop institutional policies that promote the ethical and effective integration of AI into curriculum implementation to improve the quality of teaching and learning.

Keywords: *Artificial intelligence, digital pedagogy, academic engagement, learning outcomes, ANCOVA.*

272. The Impact of Digital Technology Devices on the Academic Achievement of Business Education Students Studying Accounting in Colleges of Education in Northern Nigeria

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This study examined the effect of digital technology devices (DTDs) on the academic achievement of Business Education students enrolled in Accounting courses at Colleges of Education in Northern Nigeria. A descriptive survey and a quasi-experimental non-equivalent control group design were employed to integrate DTDs into the teaching and learning process. The findings reveal that DTDs enhance student engagement and motivation, leading to increased active participation, improved retention of accounting concepts, and higher academic performance. The timely feedback enabled by DTDs also contributed positively to student outcomes. However, challenges such as power outages and device limitations were identified. These results highlight the need to promote DTD integration in educational settings while advocating for policies and resources to address implementation barriers. This study provides valuable insights for educators, policymakers, and researchers.

Keywords: *Digital Technology, Devices, Accounting, Students, Academic Achievement.*

273. The Impact of the Digital Divide on Academic Self-Efficacy, Motivation, and Psychological Well-Being among University Students in Africa

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As African higher education institutions increasingly embrace digital transformation, persistent inequalities in access to digital technologies continue to undermine efforts toward inclusive and future-ready learning ecosystems. The digital divide remains a critical barrier that affects not only students' access to educational opportunities but also their academic engagement and psychological well-being. This study investigates the impact of digital inequality on academic self-efficacy, learning motivation, and psychological well-being among university students across selected African universities. Anchored in Social Cognitive Theory, the study examines how disparities in access to digital devices, internet connectivity, online learning platforms, and digital competencies influence students' confidence in

their academic abilities, motivation to participate in learning activities, and mental health outcomes. A mixed-methods research design will be employed, combining quantitative survey data with qualitative interviews to provide a comprehensive understanding of students' experiences within digitally unequal learning environments. The study explores relationships between digital access and indicators of student success, including academic self-efficacy, intrinsic and extrinsic motivation, stress levels, anxiety, and overall life satisfaction. It is hypothesized that students experiencing greater levels of digital exclusion will report lower academic confidence, reduced motivation, and poorer psychological well-being than their digitally connected peers. Expected findings will contribute empirical evidence to ongoing discussions on digital inclusion and educational equity in African higher education. The study further highlights the need for institutional policies and investments that expand digital access, strengthen digital literacy, and support students' psychological resilience in technology-mediated learning environments. By linking digital inclusion to both educational and psychosocial outcomes, the research offers practical insights for policymakers, university leaders, and development partners seeking to bridge the digital divide and create sustainable, inclusive, and future-ready higher education ecosystems across Africa.

274. The role of digital innovation in higher education on human capital development in 21st century Nigeria

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In meeting the requirements of the entire work the study examine the role of digital innovation in higher education as a tool of human capital development in 21st century Nigeria.Despite increase number of investment in educational technology (EdTech)and digital learning policies, the connection between higher education digital innovation and tangible human capital outcome such as graduate employability, digital literacy and entrepreneurial capacity remain under explore in the Nigerian context.This research work address that gap by investing how digital innovations (such as virtual laboratories, learning management systems, online assessment tools,and industry linked digital platforms) adopted in Nigeria higher education schools in the past two decades this has influenced the quality and relevance of the graduates entering the labour market.The study objectives is to identify the types and levels of digital innovations adopted in the higher education schools in Nigeria be it conventional or private schools and to assess the relationship between students' awareness of these innovations and to analyze institutional and infrastructural barriers limiting the effectiveness of digital innovation for human capital development. The methodology employed in the study was a quantitative method of data collection through documented literature and other available sources. The research findings revealed that basic digital tools such as internet access, email communication, and online lecture notes are recognized as tools used for widespread advanced innovations.

Keywords: *Digital innovation, higher education, human capital development.*

275. The Role of Technology in the Mentoring and Coaching of Teachers

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Traditionally, mentoring is a term generally used to describe a relationship between a less experienced individual, called a mentee or protégé, and a more experienced individual known as a mentor. However, traditional mentoring is no longer adequate in today's hyper-connected and fast-paced world. As such, today's technologically driven mentoring must embrace a new form of mentoring and knowledge sharing that allows individuals to find and connect with their colleagues so they can learn while on the job, share best practices throughout all areas of the human endeavour, and collaborate with people no matter where they are located. Technological advancements make it much easier to break down barriers and bring people together. This trend is being driven in part by the millennial generation which has a preference for connecting and learning digitally. Everyone stands to gain from approaching mentoring in a millennial fashion. It is against this backcloth, that this paper explores the role of technology in the mentoring and coaching of teachers. In an exponential manner, the paper′s synopses include understanding mentoring and coaching; theoretical bases for mentoring and coaching and the affordances of technology; rationale for compelling need of mentoring through technology; types of technological driven mentoring and the "Dos" of mentoring. Other areas include the contribution of technology to mentoring and coaching; technology resources to support the work of mentors and coaches; skills common to both mentoring and coaching as well as skills specific to mentoring. Toward the end of the paper, conlusion and recommendations are drawn.

Keywords: *Role, Technology, Mentoring, Coaching, Teachers Word Count; 249*

276. Transforming Arabic Language Education through Digital Pedagogy and Teaching Innovation: Evidence from Students' Academic Achievement at Umaru Sanda Ahmadu College of Education, Minna,...

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The integration of digital pedagogy into Arabic language education within Nigerian Colleges of Education represents a critical yet underexplored frontier for instructional transformation. Historically, Arabic instruction in these institutions has relied heavily on traditional teacher-centered methodologies, rote memorization methods and limited technological integration, contributing to declining student engagement and suboptimal learning outcomes. This paper examines the potential for digital pedagogy and teaching innovation to revitalize Arabic language education across Nigeria's public Colleges of Education. Drawing on a systematic review of existing literature and case study analysis of some conducted researches in Umaru Sanda Ahmadu College of Education Minna, the research identifies key barriers including inadequate digital infrastructure, insufficient teacher training in educational technology, non-alignment of the existing curriculum with modern trends, and a pedagogical culture resistant to innovation. Conversely, emerging opportunities through mobile learning platforms and applications, gamified vocabulary assessment tools, interactive multi-media resources, and innovative methods of teaching, demonstrate significant promise for enhancing Arabic literacy, pronunciation accuracy, and communicative competence. The study proposes a multi-phase implementation framework incorporating blended learning models, open educational resources tailored to Nigerian learners' cultural contexts, and continuous professional development for Arabic language educators. Findings suggest that strategic deployment of digital tools can address persistent challenges such as large class sizes, limited authentic language exposure, varying student proficiency levels, and limited access to native- speaker interaction. However, sustainable transformation requires policy-level investment, curriculum redesign aligning technology with pedagogical objectives, professional development for lecturers, establishing technology-enhanced language labs, and local production of digitally-mediated Arabic content reflecting Nigerian linguistic realities. This research contributes to the nascent discourse on technology-enhanced Arabic second-language acquisition in sub-Saharan Africa and offers actionable recommendations for teacher educators, curriculum developers, and educational policymakers seeking to modernize language instruction while preserving pedagogical rigor.

277. Transitioning from passive lecture formats to interactive, AI-enhanced virtual laboratory experiments and simulations

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Traditional biology higher education relies heavily on passive lecture formats and resource-intensive physical laboratories, creating significant access bottlenecks and variable learning outcomes. This study investigates the pedagogical shift toward interactive, artificial intelligence (AI)-enhanced virtual biology simulations to bridge these gaps. Utilizing adaptive learning algorithms, generative AI tutoring assistants, and real-time predictive feedback, the proposed framework transforms abstract conceptual biology such as dynamic cellular pathways, metabolic regulation, and genetic recombination into immersive, self-paced laboratory environments. A mixed-methods experimental evaluation was conducted across undergraduate biology cohorts to measure conceptual retention, problem-solving speed, and self-reported student engagement. Quantitative results demonstrate a statistically significant enhancement in critical analytical skills and concept mastery among students interacting with AI-guided simulations compared to those in traditional lecture settings. Furthermore, the virtual lab architecture drastically mitigates infrastructure constraints, providing a scalable, low-bandwidth, and equitable solution for resource-limited educational institutions. By combining intelligent tutoring systems with experiential learning design, this paper provides a robust framework for higher education institutions seeking to modernize STEM curricula, enhance scientific literacy, and foster future-ready biological learning ecosystems aligned with global digital transformation initiatives.

278. Utilisation of digital media for innovative learning in teacher education among students of Ebonyi State college of education, Ikwo

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The study investigated utilisation of digital media for innovative learning in teacher education among students of Ebonyi State College of Education Ikwo, Ebonyi State Nigeria. Two research questions guided the study and two hypotheses were formulated and tested for the study. The study adopted correlational survey design. The population comprised 300 academic staff. A sample of 200 academic staff were randomised selected using simple random sampling techniques. The instrument used for data collection was utilisation of digital media questionnaire (UDMQ) and innovative learning in teacher education questionnaire)ILTEQ). The instruments contained 15 items. The instruments were tries tested on 30 academic staff using Cronbach Alpha and a reliability coefficient of 0.87 was established. The instruments were structured on 4-Likert scale of Strongly Agreed,(SA,) Agreed (A,) Disagreed (D)and Strongly Disgreed (SD). Data collected were analysed using pearson product moment correlation to answer the research questions and test the hypotheses at 0.05 level of significance.The findings of the study showed significant relationship of utilisation of digital media with innovative learning in teacher education among students of Ebonyi State College of Education Ikwo. The study concluded and recommended that administrators of teacher education institutions should encourage utilisation of digital media in order to enhance students' innovative learning.

279. Utilization of Augmented Reality and Simulation Technologies for Teaching Abstract Chemistry Concepts in Higher Education: a Pathway to Innovative Learning in Nigeria

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This study examines the utilization of augmented reality and simulation technologies in teaching abstract chemistry concepts in higher education in Nigeria. The paper explores how these innovative digital tools enhance students' conceptual understanding, engagement, visualization of complex chemical phenomena, and academic achievement. It further highlights the potential of augmented reality and simulation-based learning to bridge instructional gaps, promote interactive learning experiences, and support the development of future-ready graduates in a rapidly evolving digital educational landscape. The study discusses opportunities, challenges, and practical strategies for integrating these technologies into chemistry instruction in Nigerian higher institutions, with implications for advancing digital innovation and improving the quality of science education. Keywords: Augmented Reality, Simulation Technologies, Chemistry Education, Higher Education, Digital Innovation, Nigeria.

280. Virtual Laboratories and Simulation-Based Inquiry: Enhancing Learner-Centered Engagement in Secondary School Biology in Nigeria

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The integration of virtual laboratories and simulation-based inquiry into secondary school Biology education has emerged as a transformative approach to enhancing learner-centered engagement in Nigeria. Traditional Biology instruction in many Nigerian secondary schools is often characterized with myriads of limitations such as inadequate laboratory facilities, insufficient instructional materials, overcrowded classrooms, and limited opportunities for practical experimentation. Virtual laboratories and simulation technologies offer innovative alternatives by enabling students to conduct experiments, explore biological concepts, and engage in inquiry-based learning within interactive digital environments. This paper examines the concept of virtual laboratories and simulation-based inquiry, their relevance to Biology education, and their potential to improve students' engagement, critical thinking, scientific literacy, and academic achievement. The paper further discusses the challenges associated with implementing these technologies in Nigerian secondary schools, including infrastructural deficiencies, inadequate teacher competencies, poor internet connectivity, and funding limitations. Recommendations are offered for policymakers, educational institutions, and other stakeholders to facilitate the effective adoption of virtual laboratory technologies. The study concludes that, the integration of virtual laboratories and simulation-based inquiry can significantly enhance learner-centered Biology education and contribute to improved educational outcomes in Nigeria.

Digital Transformation in Higher Education

117 abstracts

Institutional leadership, governance, systems and data-driven management in digital higher education.

281. "Data Protection Challenges in Digitally Transforming Universities:Cloud Services,online Learning Systems and Connected Campus Infrastructure"

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Universities are increasingly adopting cloud services, online learning systems, and connected campus infrastructure to support teaching, research, administration, communication, and student services. These technologies enhance institutional efficiency and accessibility while creating complex challenges for protecting sensitive student and institutional data. This study synthesizes contemporary evidence on data protection challenges in digitally transforming universities, focusing on cloud services, online learning systems, and connected campus infrastructure. Evidence from current research was critically analyzed to identify major data protection risks, technological vulnerabilities, institutional challenges, and emerging practices for safeguarding university data across these interconnected environments. The synthesis indicates that universities face persistent challenges involving data privacy, unauthorized access, identity and access management, insecure system integration, third-party cloud dependencies, cyber threats, inadequate security awareness, legacy infrastructure, and limited institutional cybersecurity capacity. Increasing interconnection among cloud applications, learning platforms, connected devices, campus networks, and administrative systems further expands the institutional attack surface and complicates data governance and protection. The study proposes an integrated university data protection framework that aligns cloud security, online learning system protection, connected campus security, governance, access management, user awareness, and institutional risk management. Effective data protection requires coordinated cybersecurity governance, continuous monitoring, secure technology integration, institutional capacity development, and sustained investment in cybersecurity. The proposed framework provides practical guidance for university leaders, information technology professionals, policymakers, and other stakeholders seeking to strengthen data protection within increasingly interconnected higher education environments.

Keywords: *Data protection; Universities; Cloud services; Online learning systems; Connected campus; Cybersecurity; Institutional data.*

282. A Low-Resource Multilingual NLP Framework for Adaptive Cyber Threat Intelligence in Africa's Higher Education Ecosystem: Design and a Structured Evaluation Plan

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As African universities accelerate digital transformation by migrating critical research, financial, and student data online, they face growing threats from West African cybercriminal networks whose communications remain largely invisible to conventional security tools. Threat actors operate in code-switched registers mainly Nigerian Pidgin, Yorùbá, Hausa, Igbo-inflected English, and continually evolving slang across dark web forums, Telegram, and Instagram, rendering standard English-trained natural language processing (NLP) systems structurally blind to early campaign signals. This paper presents the design of a low-resource, multilingual NLP framework for detecting Nigerian cybercriminal campaigns targeting African higher-education infrastructure. Grounded in a structured review of the dark web NLP, African-language NLP, and cybercrime literatures, the work identifies a critical gap: existing dark web NLP models (e.g., DarkBERT) are trained and evaluated exclusively on English-language content, leaving the linguistic registers actually used by West African threat actors unaddressed. The reviewed literature also indicates that multilingual adaptive fine-tuning and few-shot learning are viable under severe label scarcity, a proposition this paper's evaluation plan is designed to test on Nigerian cybercriminal text. The proposed framework integrates three components: (1) domain-adaptive continued pre-training of XLM-R on dark web and social media discourse; (2) few-shot classification combining Pattern-Exploiting Training (PET) with Low-Rank Adaptation (LoRA) parameter-efficient fine-tuning; and (3) a criminologically informed entity recognition and attribution module for campaign-level threat intelligence. This paper reports the completed design of all three components and a structured

experimental validation plan specifying the benchmarks, baselines, and metrics against which each component will be evaluated pending completion of the dedicated, in-progress Nigerian Cybercriminal Discourse Corpus; no empirical results are reported at this stage. Ultimately, the framework is intended to deliver an adaptable, low-compute security capability for university security operations centres (SOCs), regional research and education networks, and national cybersecurity agencies to intercept business email compromise and fraud campaigns before institutional compromise occurs.

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Keywords: *Cyber threat intelligence; low-resource languages; Nigerian Pidgin; multilingual NLP; dark web; adaptive fine-tuning; few-shot learning; higher education security*

283. Activity to result: An imperative to institutional transformation and sustainable development in higher education

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Institutions play a very important role in promoting national development. Though they continue to operate on activity based model, where success is measured by processes rather than outcome achieved. The concept of Activity to Result emphasize the need for organizations and institutions to shift focus from merely carrying out activities to achieving measurable outcome that drive real change in the system. Institution in most of the developing countries indulge in a lot of activities like meetings, programs, policies symposiums, reforms etc, their resources, time and energy are often spent on routine activities without clear links to impact, productivity or development. This paper examine why moving from activity based operations to result based operations is an imperative for institutional transformation and sustainable development in educational ecosystem. It highlight the culture of accountability, meritocracy, transparency, efficiency and strategic planning where activity is aligned to specific results and long term goals. By adopting a result oriented approach, institution can improve services delivery and ensure that policies translate into tangible results. The paper concludes that Activity to Result is not only a strategy but necessity to bridge the digital divide in the higher education ecosystem.

284. Adoption of Emerging Digital Technologies and Sustainable Teaching Effectiveness among Lecturers in Selected Polytechnics in Kwara State

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The integration of emerging digital technologies in higher education will continue to transform teaching and learning processes, creating opportunities for improved instructional delivery and sustainable educational outcomes. This study will investigate the adoption of emerging digital technologies and sustainable teaching effectiveness among lecturers in selected polytechnics in Kwara State, Nigeria. Specifically, the study will examine the extent to which lecturers will adopt technologies such as Learning Management Systems (LMS), artificial intelligence tools, virtual learning platforms, digital assessment systems, and collaborative online applications. The study will also assess the level of sustainable teaching effectiveness and determine the relationship between the adoption of emerging digital technologies and teaching effectiveness. A descriptive survey research design will be employed, while lecturers in selected polytechnics will constitute the study population. Data will be collected through a structured questionnaire and will be analyzed using descriptive and inferential statistics. The study is expected to reveal the extent to which lecturers will utilize emerging digital technologies in their instructional activities and how such utilization will contribute to effective teaching practices, learner engagement, content delivery, assessment, and continuous professional development. Findings from the study will provide valuable insights for educational administrators, policymakers, and institutional managers on strategies that will enhance digital innovation adoption and promote sustainable teaching effectiveness in polytechnic education. The study will also contribute to the growing body of knowledge on digital transformation in higher education institutions in Nigeria.

285. Advancing Digital Literacy in Teacher Education for Future-Ready Higher Education in Nigeria

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Education in Nigeria.

Abstract The rapid technological advancement of the 21st century has transformed global education, making a digital literacy a crucial component in teaching and learning, especially at higher education level. However, in Nigeria, factors attributed to limited access to ICT facilities, poor internet services, inadequate digital infrastructure, and insufficient digital competencies constraints the effective advancement of teacher-producing institutions. These challenges plays significant role in broadening the digital divide in higher education institutions in the country, and also limits their capacity to respond positively and effectively to the emerging technological and digital transformation in education. Therefore, this paper examines the role of the digital-literacy towards the advancement of teacher education for future-ready higher education in Nigeria. This paper explores the importance of digital-competency in teaching and learning, ICT integration in teacher preparation programs, and the growing relevance of e-learning and blended learning approaches in contemporary education. Additionally, the study further discusses factors such as infrastructural limitations, inadequate professional training, insufficient institutional support, and policy implementation gaps as major barriers to affective development in digital literacy. Drawing from relevant literature, policy documents, and current educational technology trends, this paper identified promising approaches towards addressing the emerging challenges facing digital transformation in Nigeria's higher education system. Therefore improving digital literacy among teacher educators and student-teachers, alongside greater ICT investment, capacity building, supportive policies, and technology integration, can enhance instructional delivery and educational quality in Nigeria's higher education. Collectively, these measures are promising in building a future-ready educational institutions in Nigeria, and other African countries facing similar challenges.

Keywords: *Digital Literacy, ICT Integration, Digital Divide, Higher Education, Educational Transformation, Future-Ready Education.*

286. AI and Oral English Remediation for Communicative Competence in Nigerian Secondary Education

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Persistent deficiencies in oral English proficiency among Nigerian secondary school students have remained a major challenge, affecting learners' pronunciation, fluency, articulation, classroom interaction, and overall communicative competence. Many students experience difficulties in stress placement, intonation, and effective spoken communication due to overcrowded classrooms, inadequate language laboratories, limited exposure to standard spoken English, and the absence of personalized remediation strategies. Conventional teaching approaches often fail to address learners' specific oral English needs, thereby reducing students' confidence and communicative effectiveness in academic and social contexts. The increasing advancement of Artificial Intelligence technologies in language education has created opportunities for personalized oral English remediation through speech recognition, automated correction, and adaptive learning systems. This study, therefore, investigates AI and oral English remediation for communicative competence in Nigerian secondary education. The study adopts a quantitative descriptive survey research design. The population of the study consists of 105 English language teachers drawn from selected public secondary schools across Delta North, Delta Central, and Delta South Senatorial Districts of Delta State, Nigeria. The total population sampling technique is adopted because the population size is manageable. Fifteen public secondary schools are selected across the three senatorial districts, with seven English language teachers selected from each school. Data are collected using structured questionnaires and oral English assessment rating scales validated by experts in English language education and measurement and evaluation. Reliability of the instruments is established using Cronbach's Alpha statistical method. Data collected are analysed using mean scores and standard deviation to answer the research questions, while t test statistical analysis is used to test the hypotheses at a 0.05 level of significance. Findings reveal that Artificial Intelligence significantly improves students' pronunciation, fluency, speaking confidence, and communicative competence through personalized feedback and adaptive learning processes. The study also reveals that inadequate digital infrastructure, unstable electricity supply, and limited teacher competence constitute major barriers to effective AI integration in oral English instruction. The study recommends increased government investment in digital language learning facilities, provision of stable technological infrastructure in schools, and regular training programmes for English language teachers on the effective use of AI tools for oral English remediation.

Keywords: *Artificial Intelligence, Oral English Remediation, Communicative Competence, personalized remediation strategies.*

287. Ai-Driven Digital Transformation in Higher Education: Implications for Pedagogy, Institutional Management, and Students" Engagement in the 21st Century

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Artificial intelligence (AI) is rapidly revolutionising higher education by altering teaching methodologies, institutional administration, and student involvement in the 21st century. As higher institutions of learning progressively integrate digital technology to improve teaching, learning, and administrative efficiency, AI has become a pivotal catalyst for educational innovation and systemic transformation. This study offers a conceptual examination of AI-driven digital change in higher education, emphasising its effects on pedagogy, institutional governance, and learner engagement. This analysis explores how AI-driven tools, including intelligent tutoring systems, learning analytics, generative AI applications, chatbots, and automated assessment platforms, are transforming conventional educational frameworks and fostering more personalised, adaptable, and data-informed learning environments. The research is based on the Technology Acceptance Model (TAM) and the Diffusion of Innovation Theory, which elucidate the processes by which individuals and institutions accept and assimilate innovative technology in educational settings. This study synthesises contemporary research and global policy views to elucidate how AI improves efficiency, increases decision-making, and fosters student-centered learning in higher education institutions. The document delineates principal potential for AI integration, encompassing augmented academic performance, heightened institutional response, and broadened access to quality education. Nonetheless, it underscores some problems like ethical issues pertaining to bias and data privacy, and others alike. The paper introduces an AI-Driven Higher Education Transformation Framework (AIDHETF) to tackle these challenges, conceptualising the interplay of infrastructure, human capability, regulatory environment, and AI-enhanced educational processes. The report concludes that although AI possesses considerable transformative potential for higher education worldwide, its sustainable integration necessitates deliberate investment in infrastructure, capacity development, and strong ethical governance frameworks to guarantee equitable and successful deployment.

288. AI-Enabled Entrepreneurship Education: Leveraging Generative AI and Predictive Analytics for Lean Startup Prototyping, Market Validation, and Venture Incubation in Higher Education

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Traditional university venture incubators and entrepreneurship curricula frequently face structural bottlenecks, including delayed market testing, resource constraints, and fragmented mentorship. This study introduces an AI-enabled framework for entrepreneurship education that integrates Generative AI co-pilots and predictive analytics directly into the lean startup lifecycle. Utilizing generative language models for automated value proposition design and predictive machine learning models for synthetic market trend validation, the architecture allows student founders to rapidly iterate low-fidelity prototypes, simulate consumer personas, and assess financial viability in real time. Deployed across a university business incubator network over a two-semester pilot, the efficacy of the framework was evaluated by measuring prototype iteration velocity, market validation accuracy, and early-stage seed funding acquisition rates compared to control cohorts using conventional ideation methods. The findings demonstrate that student ventures utilizing AI-driven tools achieved significantly faster market-fit iteration cycles and developed more robust, risk-mitigated business models. Additionally, the platform democratized access to specialized business development expertise, transforming university incubators into agile, digital-first innovation hubs. This research provides higher education administrators and entrepreneurship educators with a scalable, data-driven blueprint for fostering high-growth student ventures, accelerating technology transfer, and aligning campus innovation ecosystems with regional economic needs.

289. Artificial Intelligence and Educational Transformation in Colleges of Education in Nigeria: Prospects for Building Future-Ready Higher Education Ecosystems. Dr. Mrs Jerusha Obadiah Ali...

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ARTIFICIAL INTELLIGENCE AND EDUCATIONAL TRANSFORMATION IN COLLEGES OF EDUCATION IN NIGERIA: PROSPECTS FOR BUILDING FUTURE-READY HIGHER EDUCATION ECOSYSTEMS The rapid growth of Artificial Intelligence (AI) is transforming higher education globally by improving teaching, learning, research, and institutional management. In Nigeria, Colleges of Education are central to preparing teachers for a technology-driven society, yet AI adoption in these institutions remains limited due to infrastructural and capacity challenges. This paper examines the prospects of integrating AI into Colleges of Education in Nigeria and it's potential to support future-ready higher education ecosystems. Using evidence from existing literature, policy documents, and emerging educational technology practices, the paper highlights how AI can enhance personalized learning, intelligent tutoring, automated assessment, research productivity, administrative efficiency, and student support services. It also identifies key barriers to adoption, including inadequate digital infrastructure, limited technical expertise, insufficient funding, ethical concerns, and the persistent digital divide among institutions. The paper argues that effective AI integration requires strategic investment in infrastructure, educator training, supportive policies, and partnerships between government, institutions, and technology providers. It concludes that AI has significant potential to transform teacher education in Nigeria and recommends the development of institutional AI frameworks, continuous professional development programmes, and increased investment in digital technologies to ensure sustainable educational transformation.

Keywords: *Artificial Intelligence, Educational Transformation, Colleges of Education, Higher Education Ecosystems, Digital Innovation, Future-Ready Education, Nigeria.*

290. Artificial intelligence and the digital divide in African higher education: pathways to institutional resilience

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The impact of the use of AI on teaching, research and institutional management is transforming higher education. However, its integration in African higher education systems takes place in already existing structural inequalities that are defined by inadequate digital infrastructures, a lack of technological capacities and unequal readiness of institutions. These factors exacerbate the digital gap and create disparate adoption trends of AI in universities. This paper explores the relationship between artificial intelligence, digital divide and institutional resilience in Africa higher education. Its theoretical underpinning is rooted in the Digital Divide Theory and is based on a systematic analysis of the relationships between infrastructural differences, skills disparities, and differences in outcomes and their effects on the integration of AI. It addresses the impact of these differences on the ability of institutions to embrace and maintain the transformation of teaching, research and administration through the use of AI technologies. The analysis reveals that AI is not a neutral innovation, but one that plays with existing inequalities leading to different institutional outcomes. AI adoption is more likely to be successful in institutions with robust infrastructure and governance systems, and less likely to be adopted in under-resourced institutions, where adoption is fragmented and limited. Institutional resilience is one of the major factors driving these differences, as it indicates different capacities to absorb, adapt to, and transform in response to technological change. The paper points out that AI can actually exacerbate existing disparities in higher education in Africa, unless it is accompanied by targeted structural changes. It emphasises the importance of African and context-centred solutions that focus on infrastructure development, capacity building and reforming government. The study concludes that building institutional capacity to resist the impacts of AI requires reinforcing institutional resilience in a manner that directly tackles the structural dimensions of the digital divide.

Keywords: *A*

291. Artificial Intelligence as a Catalyst for Transformative Education: Harnessing Technology to Innovate, Build Resilience, and Uphold African Cultural Value in Higher Learning

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Artificial Intelligence (AI) is widely recognized as a catalyst for transformative education which goes beyond rote learning, examination results and even beyond career path. Transformative education is comprehensive in approach as it aims to nurture critical thinkers, responsible citizens and socially conscious innovators that would drive positive and sustainable changes in our societies. This can be achieved by harnessing technologies and using innovative

pedagogical practices. These innovative pedagogy not only foster critical thinking and creativity but also strengthen institutional resilience, enabling adaptive responses to disruptions such as pandemics, economic constraints, security challenges and political unrest. Importantly, the integration of AI must be context sensitive, embedding African cultural values to ensure that technological adoption reinforces rather than erodes identity. Through case studies and strategic frameworks, this presentation highlights how African universities can responsibly integrate AI to build inclusive, future-ready education systems that balance innovation with heritage. Ultimately, AI be harness in a manner that it offers a pathway to sustainable transformation, preparing graduates for global competitiveness while safeguarding Africa's unique cultural identity.

292. Artificial Intelligence Literacy, Digital Competence and Technology Acceptance as Predictors of Mathematics Students' Academic Achievement in Senior Secondary Schools in Delta State

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ABATRACT

The study examined artificial intelligence literacy, digital competence and technology acceptability as predictors of academic achievement of mathematics students in Delta State. Research design of this study was predictive co relational. The sample included 66,523 SS II students. Using Krejcie and Morgan sample size determination table and multi-stage sampling technique, a sample of 382 students was selected. Four instruments were employed to collect data. The instruments were evaluated by specialists and the reliability coefficients of 0.88, 0.85, 0.87 and 0.82 were found. The study revealed that artificial intelligence literacy, digital competence and technology acceptability are major predictors of academic achievement of mathematics students. Amongst others, it was advised that educational stakeholders should foster the development of AI literacy, digital competence and positive technology acceptance amongst students, to increase learning outcomes in Mathematics.

Keywords: *Digital competence, Artificial intelligence literacy, Technology acceptance, Academic achievement, Mathematics education.*

293. Artificial Intelligence Readiness and Digital Competence as Predictors of Teaching Effectiveness: Evidence from Colleges of Education in Southwest Nigeria

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Artificial Intelligence (AI) is rapidly transforming higher education by influencing teaching, learning, assessment, research, and institutional administration. As AI-driven technologies become increasingly integrated into educational practice, lecturers' readiness to adopt and effectively utilise these innovations is crucial to enhancing instructional quality. In addition, digital competence has emerged as a fundamental professional requirement for educators operating within technology-mediated learning environments. Despite growing interest in AI adoption and digital transformation in education, empirical evidence on the combined influence of AI readiness and digital competence on teaching effectiveness remains limited, particularly in teacher education institutions in developing countries. This study, therefore, investigated the predictive influence of AI readiness and digital competence on teaching effectiveness among lecturers in state-owned Colleges of Education in Southwest Nigeria. A correlational research design was adopted. The study involved 167 lecturers selected through a multi-stage sampling procedure. Data were collected using the Artificial Intelligence Readiness Scale (α = .77), Digital Competence Scale (α = .81), and Teaching Effectiveness Scale (α = .79). Descriptive statistics, Pearson Product-Moment Correlation, and Multiple Regression Analysis were employed for data analysis at the 0.05 level of significance. The findings revealed significant positive relationships among AI readiness, digital competence, and teaching effectiveness. AI readiness ($r = .697$, $p < .05$) and digital competence ($r = .785$, $p < .05$) were significantly associated with teaching effectiveness. Jointly, the two predictor variables explained 64% of the variance in teaching effectiveness ($R^2 = .640$, $F(2,164) = 146.085$, $p < .05$). Digital competence emerged as the stronger predictor ($\beta = .602$), while AI readiness also contributed significantly ($\beta = .241$). The study concludes that enhancing lecturers' digital competence and AI readiness is critical for improving teaching effectiveness and recommends sustained AI-focused professional development initiatives within teacher education institutions.

294. Artificial Intelligence, Building Information Modelling, and Digital Cost Management for Developing Future-Ready Quantity Surveyors in the Construction 5.0 Era

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The emergence of Construction 5.0, driven by Artificial Intelligence (AI), Building Information Modelling (BIM), digital cost management, and intelligent data analytics, is redefining the competencies required of quantity surveyors in the digital construction industry. However, many African higher education institutions continue to rely on conventional quantity surveying curricula that inadequately prepare graduates for technology-enabled project delivery and digital cost intelligence. This study examines the role of AI, BIM, and digital cost management in developing future-ready quantity surveyors for the Construction 5.0 era. The objectives were to: (i) examine the relevance of AI, BIM, and digital cost management technologies in Quantity Surveying education; (ii) identify barriers to integrating emerging digital technologies into higher education curricula; (iii) evaluate their contribution to developing competencies in digital cost planning, collaborative project delivery, predictive cost analytics, and sustainable construction; and (iv) propose a curriculum transformation framework aligned with Education 5.0, Construction 5.0, and Smart Campus initiatives. The study adopts a qualitative review of contemporary literature, policy documents, and international best practices in digital construction education. Findings indicate that integrating AI-powered estimating tools, BIM-enabled quantity take-off, digital procurement platforms, and predictive cost analytics significantly enhances experiential learning, interdisciplinary collaboration, graduate employability, and digital competencies while supporting Sustainable Development Goals (SDGs), particularly SDG 4 and SDG 9. The study concludes that curriculum innovation, investment in digital learning infrastructure, faculty capacity development, and stronger university–industry partnerships are essential for preparing quantity surveyors capable of leading Africa's digital construction transformation.

Keywords: *Quantity Surveying Education, Artificial Intelligence, Building Information Modelling (BIM), Digital Cost Management, Predictive Cost*

295. Artificial Intelligence-Driven Governance in Higher Education: Implication for Colleges of Education in Nigeria

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This paper examines the implications of AI-driven governance for Colleges of Education in Nigeria. Drawing on relevant literature and Socio-Technical Systems Theory, the paper discusses the meaning of Artificial Intelligence, AI-driven governance, its applications, the challenges affecting adoption and measures for responsible implementation in Higher Education in Nigeria. The discussion shows that AI can support academic planning, student admissions, staff deployment, examination administration, resource allocation and quality assurance by helping institution management organise and interpret information. However, challenges such as inadequate infrastructure, limited funding, insufficient technical skills among staff, data protection concerns and uncertainty about accountability may affects its adoption by various Higher Education management. The paper argues that acquiring AI tools without improving institutional records, staff competence and administrative procedures is unlikely to produce lasting benefits. It also emphasises that decisions affecting students, staff and academic programmes must remain subject to human judgement and established institutional regulations. The paper concludes that Colleges of Education should adopt AI in ways that reflect their resources, responsibilities and governance arrangements. Institutional leadership and sustained oversight remain equally important. The paper recommends the establishment of institutional AI governance committees, investment in digital infrastructure, regular staff training, clear data protection and accountability policies.

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Keywords: *Artificial Intelligence; AI-Driven Governance; Higher Education; Colleges of Education; Dual Mandate Policy.*

296. Assessing the Perceived Impact of Digital Transformation on Teaching and Learning in Higher Education Institutions in Gusau, Zamfara State

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Digital transformation has become a significant catalyst for change in higher education, influencing teaching, learning, research, and administrative processes. The integration of digital technologies is gradually shifting educational practices from traditional teacher-centered approaches to more flexible, interactive, and learner-centered models. This transformation has the potential to enhance students' engagement, improve access to educational resources, and support learning beyond the conventional classroom environment. This study seeks to examine perceptions of the impact of digital transformation in higher education institutions in Gusau, Zamfara State, Nigeria. Specifically, the study aims to explore stakeholders' views regarding the influence of digital technologies on teaching effectiveness, student learning experiences, institutional efficiency, and access to educational opportunities. The study also intends to identify the challenges affecting the adoption and implementation of digital transformation initiatives within higher education institutions in the state. A descriptive survey research design is being employed, targeting academic staff and students from selected higher education institutions in Gusau, Zamfara State. Data are currently being collected through structured questionnaires. The findings are expected to provide insights into the current state of digital transformation, its perceived benefits, and the barriers limiting its effective implementation. The outcome of the study is anticipated to contribute to policy formulation and strategic planning aimed at strengthening digital transformation initiatives in higher education institutions within Zamfara State and Nigeria at large.

297. Assessment of Utilization of Digital Innovation Northeastern Nigerian Higher Institutions

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The study assessed the utilization of digital innovations in North-Eastern Nigerian higher institutions. It specifically determine the level of availability of digital innovations, assess the extent of utilization of digital innovations by academic staff and students and determine factors influencing the utilization of digital innovations in the higher institutions. Multistage sampling technique was adopted to sample the 209 respondents and the data obtained were analyzed using mean with the aid of lickert scale and logit regression model. The result on the availability of digital innovation shows a grand mean score of 3.63, indicates digital innovations are generally available with the online registration platforms recorded the highest mean score (4.37), followed by internet facilities (4.21) and digital libraries (4.03). However, artificial intelligence tools (2.74) and virtual laboratories (2.65) were found to be inadequately available. The result on the extent of utilization of digital innovations shows a grand mean score of 3.50 indicates a high level of utilization of digital innovations among academic staff and students. Online registration platforms (4.25) and internet facilities (4.12) were the most utilized technologies. However, artificial intelligence tools (2.48) and virtual laboratories (2.42) recorded low utilization levels. The logistic regression results indicate that educational qualification, ICT training, internet accessibility, availability of infrastructure, institutional support, electricity supply, and digital skills competency significantly influence the utilization of digital innovations. Age and gender were not statistically significant, indicating that utilization is largely determined by access, institutional factors and digital competencies rather than demographic characteristics. The study recommends that higher institutions should invest in advanced digital technologies such as artificial intelligence tools, virtual laboratories, and smart learning systems to improve educational delivery, institutional administrators should provide regular Information Communication Technologies (ICT) training and digital literacy programmes for academic staff and students as well as government and educational stakeholders should improve internet connectivity and broadband infrastructure within higher institutions.

Keywords: *Utilization, Digital, Innovations, North-Eastern and Higher Institutions*

298. Bridging Conceptual and Mathematical Barriers in Quantum Mechanics through Digital Learning Technologies: Evidence from Undergraduate Physics Students in Nigeria

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Quantum mechanics is widely recognized as one of the most challenging subjects in undergraduate physics due to its abstract concepts and extensive mathematical requirements. These challenges often hinder conceptual understanding, reduce engagement, and negatively affect academic performance. This study investigated the conceptual, mathematical, psychological, and instructional challenges faced by undergraduate physics students in learning

quantum mechanics at the Federal University of Education, Pankshin, Nigeria, while examining the potential role of digital learning technologies in addressing these difficulties. An exploratory survey design was adopted to investigate the challenges experienced by undergraduate physics students and the potential of digital learning technologies in addressing them. Data were collected from twenty undergraduate physics students through a structured questionnaire and analyzed using frequencies and percentages to identify the major conceptual, mathematical, and instructional barriers to learning quantum mechanics. Findings revealed significant difficulties in understanding abstract concepts such as wavefunctions, superposition, and probability interpretation. Mathematical challenges associated with calculus, differential equations, and linear algebra were also found to adversely affect learning outcomes. Furthermore, fear of complex topics and anxiety limited students' engagement with the subject. The study revealed inadequate access to digital instructional resources, including computer simulations, virtual laboratories, multimedia visualizations, and other technology-supported learning tools that could enhance understanding of complex quantum phenomena. The study argues that integrating digital learning technologies can help bridge conceptual and mathematical barriers in quantum mechanics through interactive visualizations, virtual experimentation environments, and learner-centered instructional approaches. Such innovations have the potential to improve conceptual understanding, strengthen mathematical application, reduce learning anxiety, and promote active engagement. The findings highlight the need for greater investment in digital pedagogy and technology-enhanced STEM education within African higher education institutions and contribute to ongoing discussions on building future-ready higher education ecosystems through digital innovation and equitable access to quality learning resources.

299. Bridging the digital divide and promoting inclusion, equity and access for all: An appraisal of Political Science Instructions in Higher Institutions of learning in Africa

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The digital divide remains a significant barrier to inclusive and equitable higher education across Africa, particularly in Political Science instruction where access to information and civic knowledge is essential. This qualitative study appraises the extent to which higher institutions of learning in Africa are bridging digital inequalities and promoting inclusion, equity, and access for all learners. Using a thematic analysis of scholarly literature, policy documents, and institutional reports, the study explores the opportunities and challenges associated with the integration of digital technologies in Political Science education. Findings reveal that while digital innovations have enhanced access to learning resources, encouraged collaborative engagement, and expanded educational opportunities, disparities in infrastructure, connectivity, digital literacy, and socioeconomic conditions continue to limit their effectiveness. The paper argues that sustainable investments in digital infrastructure, inclusive policies, and capacity building are critical for ensuring equitable participation and improving learning outcomes. It concludes that bridging the digital divide is essential for fostering democratic citizenship and educational transformation in Africa.

300. Bridging the Digital Divide and Promoting Inclusive Education

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The digital divide continues to undermine efforts to achieve equitable education, particularly for marginalized learners in low-resource contexts. Bridging this divide is essential for promoting inclusive education aligned with Sustainable Development Goal 4. This study examines strategies for bridging the digital divide and their impact on promoting inclusive education in higher and basic education institutions. Employing a mixed-methods design, data were collected from 500 students and 60 educators across urban and rural institutions through surveys, and from 15 key stakeholders via in-depth interviews. Quantitative data were analyzed using t-tests and regression analysis to assess the relationship between digital access and learning outcomes, while qualitative data were analyzed thematically. Findings reveal that limited internet connectivity, lack of digital devices, and low digital literacy are primary drivers of exclusion. However, targeted interventions such as device provision programs, offline digital content, and teacher training in accessible pedagogy significantly improved participation and learning outcomes for students with disabilities, low-income learners, and rural populations. The study concludes that bridging the digital divide requires multi-stakeholder action combining infrastructure investment, inclusive technology design, and capacity building. Recommendations include policy reforms for universal digital access, adoption of universal design for learning, and public-private partnerships to scale inclusive digital education.

Keywords: *digital divide, inclusive education, educational technology, accessibility, equity, SDG 4*

301. Bridging the Digital Divide for Future-Ready Chemistry Students: Implications for Higher Education in Nigeria

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The digital divide poses a major barrier to preparing chemistry students for 21st century careers in Nigeria. This study examines how gaps in digital access and skills affect the future readiness of chemistry students and draws implications for higher education reform. A co-relational survey research design was adopted. A sample of 300 undergraduate chemistry students and 45 lecturers was selected from three public universities in Nigeria using stratified random sampling. Data were collected using a validated questionnaire on digital access, digital literacy, ICT integration in chemistry learning, and a "Future-Ready Skills" scale covering problem solving, data analysis, and digital collaboration. Pearson correlation and multiple regression were used to analyse relationships. Results showed that 72% of students reported having inadequate access to reliable internet and virtual chemistry tools. Digital access and digital literacy significantly predicted future-ready skills, $R2=0.41$, $P< 0.001$. Students with higher digital competence scored higher on self-reported readiness for research, industry, and entrepreneurship. Institutional factors like poor e-lab facilities and low lecturer training in digital pedagogy were key moderators. The study concludes that bridging the digital divide requires more than device provision. Nigerian higher education must invest in three areas: (1) Infrastructure and affordable internet, (2) Digital pedagogy training for chemistry lecturers, and (3) Curriculum integration of computational chemistry and data tools. Addressing these gaps is critical for producing globally competitive chemistry graduates.

Keywords: *Digital divide, Chemistry education, Future-ready skills, Higher education, Nigeria, ICT integration*

302. Bridging the Digital Divide in African Medical and Health Sciences Education: Reimagining Inclusive, Resilient and Future-Ready Universities

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The rapid advancement of digital technologies, artificial intelligence and online learning is transforming higher education globally; however, significant digital inequalities continue to limit the ability of many African universities to benefit fully from these innovations. This challenge is particularly critical in medical and health sciences education, where access to reliable digital infrastructure, connectivity, devices, digital skills and quality electronic learning resources increasingly influences the quality and inclusiveness of education. This paper examines strategies for bridging the digital divide and developing future-ready higher education ecosystems in Africa, with particular emphasis on medical and health sciences institutions. It argues that digital transformation should extend beyond the provision of infrastructure to encompass affordable connectivity, digital literacy, artificial intelligence, innovative pedagogy, locally relevant digital content, staff development, cybersecurity and equitable access for students in underserved communities. The paper further proposes an integrated institutional framework that places access, inclusion, innovation, resilience and human capacity development at the centre of digital transformation. It concludes that African universities can convert digital inequality into an opportunity for transformative educational development by strengthening partnerships among governments, universities, technology providers and development partners. Such an approach will contribute to more inclusive, resilient and globally competitive higher education systems capable of preparing African graduates for the demands of the Fourth Industrial Revolution.

Keywords: *Digital Divide; Higher Education; Artificial Intelligence; Medical Education; Digital Transformation; African Universities; Inclusive Education; Resilience*

303. Bridging the Digital Divide in Education in Nigeria: Prospects and Challenges for Academic Libraries

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Academic Libraries in Nigeria stand at a critical crossroads in the evolution from traditional book repositories to dynamic digital knowledge hubs. This empirical paper examines the prospects and challenges of bridging the digital devide within Nigerian academic libraries, drawing on evidences from recent studies conducted between 2023 and

2026. The analysis reveals that while digital technologies have transformed library services through Online Public Access Catalogues (OPAC), Digital Repositories and Electronic Information Resources, Yet, significant barriers still persists. For an instance, In Nigeria, epileptic power-supply remains the most serve threat to digital libraries sustainability in the country. Followed by inadequate internet bandwidth, frequent equipment breakdowns, limited digital literacy skills and academic integrity among the library users. Nonetheless, promising developments including the emergence of solar-powered digital libraries are in the heat "as a boon" to the society, growing adoption of open educational formats to facilitate fast learning and teaching, targeted information literacy programmes, have given us the seemed lost glory of the digital sustainable in the country. Therefore, the paper concluded that Nigerian academic libraries are uniquely positioned to facilitate digital inclusion across the Three critical dimensions: Digital Acceptance, Digital Literacy Information and Digital Accessibility. However, achieving this potential requires, Coordinated investment in infrastructure, skills development and sustainable funding. The funding have the implications for policymakers, University Administrator and library professionals seeking to navigate the complexities of digital transformation in a resource-constrained environments.

Keywords: *Academic Libraries, Digital Divide, Digital Information Literacy, Nigeria.*

304. Bridging the Digital Divide in Higher Education: Assessing Infrastructure, Connectivity, and Policy Gaps for Future-Ready Ecosystems – A Case Study of College of Education, Akwanga (...

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The transition to digital and hybrid learning has exacerbated the digital divide in Nigeria's Colleges of Education, raising concerns about readiness for future-facing higher education ecosystems. This paper assesses digital infrastructure, internet connectivity, and policy implementation at the College of Education, Akwanga (Nasarawa State), as a case study of challenges in North Central Nigeria. Using institutional documents, TETFund/NCCE reports, and primary data from staff and students, the study examines ICT facility availability, campus internet access, electricity reliability, ownership of device, affordability of data, and levels of digital literacy. It also evaluates alignment with the National Digital Economy Policy and NCCE's Benchmark and Minimum Academic Standards. Findings show that despite national policy frameworks, COE Akwanga faces gaps including inadequate computer laboratories, unstable campus Network, epileptic power supply, and limited lecturer capacity for e-pedagogy. The paper recommends solar-powered ICT hubs, public-private connectivity partnerships, zero-rated academic platforms, and continuous digital upskilling for lecturers to bridge the divide and reposition the College for future-ready education delivery.

Keywords: Digital divide, Colleges of Education, ICT infrastructure, policy implementation, future-ready ecosystems

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305. Bridging the Digital Divide in Higher Education: Challenges and Future Prospects for Dual Mandate Colleges of Education in North Central Nigeria

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The rapid advancement of digital technologies has transformed higher education globally, creating new opportunities for teaching, learning, research, and institutional management. However, the benefits of digitalization remain unevenly distributed across Nigerian higher education institutions due to persistent infrastructural and socio-economic challenges. This paper examines the nature and implications of the digital divide in Nigerian higher education and its impact on the development of Dual-Mandate future-ready graduates. Adopting a conceptual review approach, the study identifies major barriers including inadequate ICT infrastructure, unreliable power supply, poor internet connectivity, insufficient funding, and low levels of digital literacy among students and academic staff across the North Central Nigeria. The paper further explores emerging opportunities associated with e-learning platforms, artificial intelligence, virtual learning environments, and digital research tools for improving educational access, quality, and innovation. It argues that bridging the digital divide requires strategic investment in digital infrastructure, effective policy implementation, capacity building, and strengthened collaboration between government, higher education institutions, and the private sector. The study concludes that overcoming digital inequalities is critical to building resilient, inclusive, and globally competitive Dual Mandate Colleges of Education capable of supporting sustainable

national development in Nigeria.

306. Bridging the Digital Divide in Nigerian Higher Education: Challenges and Prospects

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Being A Paper Presented At The International Conference On The Theme Bridging The Digital Divide: Reimagining Future Ready Higher Education Ecosystem In Africa Slated For 23rd – 27th November, 2026 At The University Of Kigali Rwanda.

Abstract The rapid advancement of digital technologies has fundamentally transformed the global higher education landscape, creating unprecedented opportunities for teaching, learning, research, and institutional management. However, the benefits of digitalization remain unevenly distributed across higher education institutions in Nigeria, thereby widening the digital divide among students, academic staff, and institutions. This paper examines the challenges and prospects of bridging the digital divide in Nigerian higher education within the context of the emerging knowledge economy and the Fourth Industrial Revolution. Drawing on the Digital Divide Theory, the study adopts a qualitative approach based on a review of relevant literature, policy documents, and empirical studies on digital technology adoption in Nigerian tertiary institutions. The paper identifies inadequate digital infrastructure, poor internet connectivity, erratic power supply, limited funding, digital illiteracy, and socioeconomic disparities as major barriers to effective digital inclusion in higher education. It further highlights how these challenges disproportionately affect students in rural and underserved communities, thereby limiting equitable access to quality education and digital learning opportunities. Despite these constraints, the study argues that significant prospects exist through government-led digital transformation initiatives, increased investment in information and communication technology (ICT), public-private partnerships, expansion of broadband access, capacity-building programmes, and the growing integration of artificial intelligence and other emerging technologies in educational delivery. The paper concludes that bridging the digital divide is essential for promoting inclusive, equitable, and sustainable higher education in Nigeria. It recommends strategic investment in digital infrastructure, enhanced digital literacy programmes, supportive policy frameworks, and collaborative stakeholder engagement to ensure that Nigerian higher education institutions are adequately positioned to meet the demands of the twenty-first-century digital ecosystem.

Keywords: *Digital Divide, Higher Education, Digital Inclusion, Information and Communication Technology (ICT), Digital Transformation, Nigeria.*

307. Bridging The Digital Divide in Nigerian Higher Education: Evidence from Accounting Professionals

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This study examined the digital divide in Nigerian higher education and its implications for graduate preparedness from the perspective of accounting professionals. Specifically, the study investigated the major dimensions of the digital divide, assessed its implications for the digital preparedness of accounting graduates, identified barriers to digital inclusion, and evaluated strategies for bridging the divide. The study adopted a descriptive survey research design and collected primary data through a structured questionnaire administered to accounting professionals. A total of 100 questionnaires were distributed, of which 82 were correctly completed and used for analysis. Data were analysed using descriptive statistics, specifically mean ranking and standard deviation. The findings revealed that limited access to reliable internet services, high internet costs, unequal access to digital technologies, inadequate digital devices, and disparities in digital literacy constitute major dimensions of the digital divide in Nigerian higher education. The study further found that the digital divide adversely affects accounting graduates' readiness for technology-driven workplaces by limiting their exposure to digital tools and emerging technologies. Inadequate ICT infrastructure, poor internet connectivity, irregular electricity supply, insufficient funding, and inadequate digital skills were identified as the major barriers to digital inclusion. The findings also showed that increased government investment in digital infrastructure, affordable internet access, digital skills training, curriculum integration of emerging technologies, and stakeholder collaboration are critical strategies for bridging the digital divide. The study concludes that addressing digital inequalities is essential for enhancing graduate preparedness and ensuring that Nigerian higher education institutions can effectively contribute to the development of a digitally competent workforce. The study recommends sustained investment in digital infrastructure, digital literacy development, and technology-oriented curriculum reforms.

308. Bridging the Digital Divide in Nigerian Public Universities: A Multi-Criteria Decision Framework for Prioritising Digital Transformation Investments

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Nigerian public universities face a widening digital divide, yet the resources available to close it are scarce and must be allocated among competing investments. Decisions on whether to invest in campus connectivity, power infrastructure, devices, platforms or human capacity are frequently taken without a transparent and replicable method. This paper proposes a multi-criteria decision framework, grounded in the Analytic Hierarchy Process (AHP), for prioritising digital-divide-reduction investments in Nigerian public universities. Drawing on the resource-based view, the Technology–Organisation–Environment (TOE) framework and van Dijk's resources-and-appropriation theory, the framework structures the decision around five criteria (equity of access, teaching and learning impact, cost-effectiveness, implementation feasibility and sustainability) and five investment alternatives (campus Wi-Fi and bandwidth expansion, solar-hybrid power for ICT facilities, a mobile-first offline-capable learning management system, digital literacy and digital pedagogy training, and a device loan scheme). An illustrative application, using structured judgments informed by recent evidence from North-Eastern Nigeria, demonstrates the full procedure, including consistency checking and one-at-a-time sensitivity analysis. In the illustration, the mobile-first learning platform (0.300) and digital capacity building (0.284) dominate capital-intensive alternatives, and the leading pair remains stable across wide variations in criterion weights. The framework provides university leaders, regulators and development partners with a transparent instrument for justifying investment decisions under budgetary constraints. Empirical validation through expert panels in Nigerian universities is proposed for future research.

Keywords: *digital divide; digital transformation; higher education; Analytic Hierarchy Process; multi-criteria decision-making; Nigeria*

309. Bridging the Digital Divide through Open-Source Programming Platforms for Teaching and Learning in Sub-Saharan African Institutions for Higher Learning

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The persistent digital divide across Sub-Saharan African tertiary institutions continues to constrain equitable access to quality programming education, software development training, and the acquisition of twenty-first-century digital competencies. While higher education systems in more developed regions are increasingly integrating advanced digital tools into teaching and learning, many tertiary institutions in Sub-Saharan Africa continue to face structural challenges such as high licensing costs of proprietary software, inadequate digital infrastructure, limited access to modern programming environments, and insufficient technical capacity among educators and students. In response to these constraints, open-source programming platforms have emerged as a transformative and sustainable alternative for enhancing programming education and bridging the digital divide. This paper investigates the role of open-source programming platforms in improving the teaching and learning of programming within Sub-Saharan African tertiary institutions. It explores the pedagogical and technological contributions of widely adopted open-source tools such as GitHub, GitLab, Visual Studio Code, Linux-based operating systems, Python programming ecosystems, and collaborative coding environments. These platforms enable students and educators to engage in authentic software development practices, including version control, collaborative coding, debugging, project-based learning, and continuous integration workflows, thereby strengthening conceptual understanding and applied programming skills. Furthermore, the study highlights how open-source programming ecosystems reduce dependency on expensive proprietary software, making programming education more accessible to resource-constrained institutions. By promoting collaboration, transparency, and shared knowledge production, these platforms foster peer learning, innovation, and community-driven software development among students and faculty. However, the paper also identifies critical barriers to effective adoption, including inadequate infrastructure, unreliable internet connectivity, limited institutional support, and insufficient professional development opportunities for educators in open-source technologies. The paper argues that the strategic integration of open-source programming platforms into curricula can significantly enhance computational thinking, problem-solving abilities, and graduate employability in Sub-Saharan Africa. It concludes that sustained investment in digital infrastructure, capacity building, and supportive institutional policies is essential for leveraging open-source ecosystems to bridge the digital divide and build future-ready tertiary

education systems in Sub-Saharan Africa.

310. Bridging the Digital Divide through the Digital Transformation of Academic Libraries in Edo State, Nigeria: Implications for Future-Ready High Education

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The increasing integration of digital technologies into higher education has positioned academic libraries as critical enablers of teaching, learning, research, and innovation. However, disparities in access to digital resources, infrastructure, and skills continue to widen the digital divide in many developing regions, including Nigeria. This study examines how digital transformation of academic libraries can bridge the digital divide in Edo State, Nigeria, and enhance the development of future-ready higher education institutions. Using a descriptive survey design with a correlational approach, the study will investigate the extent of digital transformation initiatives in selected academic libraries in Edo State, focusing on digital infrastructure, electronic resources, internet connectivity, digitization of library services, and staff and user digital competencies and examines their relationship with efforts to bridge the digital divide in higher education. Data will be collected from academic librarians, library staff, and library users through structured questionnaires and interviews and analyzed using descriptive and inferential statistical techniques. The study anticipates finding significant gaps in digital readiness among academic libraries, arising from inadequate funding, poor ICT infrastructure, unstable power supply, limited internet access, and insufficient capacity-building opportunities. Despite these challenges, digital transformation initiatives are expected to demonstrate considerable potential for improving access to information resources, supporting digital pedagogy, enhancing research productivity, and promoting inclusive learning environments. The study concludes that strategic investment in digital infrastructure, staff development, and supportive institutional policies is essential for narrowing the digital divide and strengthening the role of academic libraries in higher education. The findings will provide evidence-based recommendations for policymakers, educational administrators, and library professionals seeking to leverage digital innovation to build resilient, inclusive, and future-ready higher education ecosystems in Edo State, Nigeria, and beyond.

311. Bridging the Digital Divide: Modern Technologies and Digital Advancement in Chemistry in Colleges of Education, North-Central, Nigeria

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Quality education is imperative rather central to social and economic progress to any nation, such as Nigeria. Because, Nigeria is working towards transition to knowledge-based economies. This study was an attempt to ascertain the extent to which modern Technologies and digital advancement can improve learner-centred methods in Chemistry Education in Colleges of Education in North-Central, Nigeria. The study examines technology adoption, students responses, challenges and strategies for systematic improvement. A descriptive survey design was adopted for this study, questionnaire was the instrument used. One hundred (100) NCE Students were used as respondents and twenty Lecturers were drawn from five (5) Colleges of Education in North-Central, Nigeria. Data analysis was done through the use of descriptive statistical tools of Frequency counts, table, percentages, mean scores and standard deviations. The paper proposes a digital transformation framework that explain how emerging technologies can bridge the divide between access and effective utilization in learning environments. Findings suggest that, there is the need for investment in infrastructure, data subsidies, expanded teacher training and public-private partnership (PPP). The study concludes that, though modern technologies offer transformative potential, equitable digital education in Colleges of Education in the North-Central, Nigeria, hence a coordinated, inclusive and well-resourced national strategy is needed.

Keywords: *North-Central, Digital divide, Chemistry Education, Colleges of Education, Modern Technologies Advancement*

312. Bridging the Digital Divide: Reimagining Future-Ready Educational Psychology in Higher Education Ecosystems in Africa

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The rapid advancement of digital technologies has transformed educational systems worldwide, creating new opportunities and challenges for higher education institutions. In Africa, the persistent digital divide continues to hinder equitable access to quality education, limiting the development of future-ready graduates. This paper examines the role of educational psychology in addressing digital inequalities and reimagining teaching, learning, and student support systems within African higher education ecosystems. Drawing on contemporary literature and emerging educational technologies, the study explores how psychological principles can inform the design of inclusive, learner-centered, and technology-enhanced educational environments. The paper highlights key factors influencing digital learning adoption, including digital literacy, motivation, self-regulated learning, socio-economic disparities, and institutional readiness. It further discusses strategies for fostering cognitive engagement, resilience, and adaptability among learners in an increasingly digital world. The study concludes that bridging the digital divide requires a multidimensional approach involving policy reforms, infrastructure development, capacity building, and the integration of educational psychology principles into digital transformation initiatives. By reimagining educational psychology for the digital age, African higher education institutions can create sustainable and inclusive learning ecosystems capable of preparing students for the demands of the twenty-first-century knowledge economy.

Keywords: *Digital Divide, Educational Psychology, Higher Education, Digital Learning, Africa, Future-Ready Education, Technology Integration, Inclusive Education.*

313. Bridging the Gap between Technology and Teaching: Curriculum Innovation for 21st Century Teacher Education in Africa

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Integrating emerging technologies into teacher education is a vital pathway for transforming Africa's education systems and equipping teachers with 21st-century skills. This paper explores curriculum innovations designed to bridge the gap between traditional teaching methods and digital imperatives. Key pillars highlighted include: developing strong infrastructure, ensuring equitable access to technology, strengthening teacher digital competence, embedding technology into pedagogy, creating localized and culturally relevant content, promoting 21st-century skills, embracing blended learning models, sustaining continuous professional development, and aligning policy with institutional practices. Drawing on examples from Nigeria, Kenya, Rwanda, and South Africa, the study illustrates how innovations are being applied in practice. Despite progress, challenges such as poor infrastructure, lack of teacher confidence, and weak policy implementation persist. The paper emphasizes the need for reforms that are holistic, inclusive, and contextually grounded to empower teachers as leaders of sustainable educational transformation in Africa.

314. Challenges of Digital Innovation Integration in Nigeria's Tertiary Institutions of Learning: A Review of Emerging Issues and Future Directions

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Digital innovation has emerged as a transformative force in higher education globally, reshaping teaching, learning, research, administration, and institutional governance. In Nigeria, tertiary institutions have increasingly adopted digital technologies such as learning management systems, virtual classrooms, cloud computing, artificial intelligence (AI), digital libraries, and electronic administrative platforms. While these innovations offer significant opportunities for improving educational quality and institutional efficiency, their integration remains fraught with numerous challenges. This review examines the major barriers to digital innovation integration in Nigerian tertiary institutions for the past two decades. The study synthesizes evidence from recent empirical and policy literature to identify infrastructural, financial, technological, institutional, socio-cultural, and policy-related constraints. Findings reveal that inadequate ICT infrastructure, unstable electricity supply, poor internet connectivity, insufficient funding, digital skills gaps, cybersecurity concerns, resistance to change, and weak policy implementation significantly hinder digital transformation efforts. The review further discusses the implications of these challenges for educational quality, institutional competitiveness, and sustainable development. Recommendations are provided to strengthen digital innovation ecosystems within Nigerian higher education institutions.

Keywords: *Digital Innovation, Digital Transformation, e-learning, Tertiary Education.*

315. Contemporary Technologies for Medical Libraries: An innovative sustainable development technique for effective retrieval of medical information for users of Medical Libraries in benue State...

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This paper investigated contemporary technologies for effective retrieval of information in medical college libraries in Benue and Kwara States of Nigeria. The specific objectives are; identify contemporary technological resources, determine the extent contemporary technological resources were used for effective retrieval of information, and identify challenges associated with contemporary technologies for effective retrieval of medical information. Research questions are; what are the contemporary technological resources; what is the extent of contemporary technological resources for effective retrieval of information; what are the challenges of contemporary technologies for retrieval of information. The study adopted descriptive survey, with a population of 1035 comprising medical students from the two universities. The sample size is 207; a proportionate stratified random sampling technique was used to select 207 medical students at 20% stratum representing each medical college. The questionnaire titled "Contemporary technologies for effective retrieval of information in medical college libraries in Benue and Kwara States" were distributed, and 200 were returned valid for data analysis representing a return rate of 96%. The data collected were analysed using descriptive statistics of Mean and standard deviation. The findings show that, Medical Libraries under study to a high extent have one form of contemporary technological information resources or the other. Challenges in information retrieval are: inadequate supply of contemporary technologies to accommodate students and delay in payment of internet subscription. Recommendations are; provision of adequate number of contemporary technologies for easy accessibility, improvement on real time subscription that will enhance retrievals. Librarians should imbibe sustainable development techniques as well as indulge in accessing medical educational websites for effective medical information retrieval and a host of other contemporary health information resources.

316. Determinants of cryptocurrency investment intention among students in Kaduna State University, KASU

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This study examined the determinants of cryptocurrency investment intention among students of Kaduna State University, with a focus on financial literacy, perceived risk, and social influence. Anchored on Ajzen's (1991) Theory of Planned Behavior, the research adopted a quantitative survey design. The target population comprised 2,359 students from the Faculty of Management Sciences (2024/2025 academic session), from which a sample of 430 respondents was drawn using the Krejcie and Morgan (1970) table and adjusted by 30% to account for potential non-responses and deviations. Data were collected through structured questionnaires and analyzed using descriptive statistics, correlation analysis, and multiple regression. The results revealed that financial literacy ($\beta = 0.296$, $p < 0.01$) and social influence ($\beta = 0.641$, $p < 0.01$) positively and significantly influenced students' cryptocurrency investment intentions, while perceived risk ($\beta = -0.068$, $p < 0.01$) had a significant negative effect. The model explained 68.4% of the variance in investment intention ($R^2 = 0.684$). The findings show the importance of financial literacy and social influence in shaping investment behaviors among university students, while perceived risk acts as a barrier. The study contributes to knowledge by highlighting behavioral and cognitive determinants of cryptocurrency investment intentions in the Nigerian higher education context and offers practical implications for financial education and digital investment initiatives targeting students.

317. Digital Competence and Utilization of Innovative Teaching Technologies among Health Education Lecturers in Tertiary Institutions in Bauchi State, Nigeria

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This study examined digital competence and the utilization of innovative teaching technologies among Health Education lecturers in tertiary institutions in Bauchi State, Nigeria. As digital technologies become increasingly important in higher education, lecturers' ability to effectively use these tools is essential for improving teaching and learning outcomes. The study was guided by two objectives and two corresponding null hypotheses tested at the 0.05 level of significance. A descriptive survey research design was employed. The population consisted of 50 Physical and

Health Education lecturers drawn from three purposively selected tertiary institutions in Bauchi State: Aminu Saleh College of Education, Azare; Adamu Tafawa Balewa College of Education, Kangere; and the College of Health Technology, Ningi. Due to the manageable population size, all 50 lecturers participated in the study. Data were collected using a structured questionnaire and analyzed using frequency counts, percentages, mean, standard deviation, independent t-test, and Analysis of Variance (ANOVA). The findings indicated that the lecturers possessed a high level of digital competence and demonstrated moderate utilization of innovative teaching technologies in instructional delivery. The results also revealed no significant differences in digital competence and technology utilization among the lecturers. The study concluded that digital competence enhances the adoption of innovative teaching technologies and recommended continuous digital skills training, improved access to technological resources, and greater institutional support for technology integration in teaching.

Keywords: *Digital Competence, Utilization, Innovative Teaching Technologies, Health Education Lecturers and Tertiary Institutions*

318. Digital Disruption and Undergraduate Students' Reading Habits in Nigeria: Rethinking the Role of Librarians in a Mobile Learning Environment

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The increasing emergence of mobile technologies has radically transformed the reading habits of Nigerian undergraduate students, leading to a noticeable shift from traditional print-based reading to digital and mobile learning platforms. This digital disruption, while offering unprecedented access to educational and recreational reading materials, has raised concerns about the depth, purpose, and academic value of reading engagements among the students. The widespread use of smartphones, tablets, and other portable devices enables convenient access to e-books, e-journals, and other online learning resources, yet questions remain about the reading culture it fosters, whether it encourages meaningful intellectual development or merely promotes superficial engagement. Anchored on the Uses and Gratifications Theory (UGT), which explores how individuals actively seek out media to satisfy specific needs, this study examines the motivations, preferences, and challenges of Nigerian undergraduate students in their reading practices. UGT provides a theoretical lens through which to understand how youths use mobile reading tools to gratify academic, social, or entertainment needs, and how these needs shape the evolution of their reading culture. Additionally, the study explores the changing role of librarians in this digital reading ecosystem. Accordingly, the study seeks to address three key research questions, including: (1) What are the prevailing reading habits and preferences of Nigerian undergraduate students in the era of mobile technology? (2) What gratifications do undergraduate students derive from digital reading platforms? (3) How can librarians respond proactively to support and strengthen reading culture in this mobile learning environment? The findings of the study will contribute to understanding undergraduate students' engagement with digital materials and propose practical strategies for librarians to support sustained, meaningful reading in the age of mobile learning.

319. Digital Education, Transformation and Security Vulnerability in West African Higher Education Institutions

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Digital transformation is advancing higher education in West Africa by improving access, collaboration, and administrative efficiency through AI, virtual learning, and cloud computing. However, this rapid expansion has introduced significant cybersecurity vulnerabilities that threaten institutional sustainability and effectiveness. This paper examines key challenges facing West African higher education institutions, including cyberattacks, phishing, data breaches, identity theft, online exam malpractice, and unauthorized database access. It also analyzes the impact of poor cybersecurity awareness, inadequate ICT infrastructure, weak institutional policies, and limited funding. Using a descriptive analytical approach, the study evaluates how these vulnerabilities affect academic integrity, institutional reputation, data protection, and educational continuity. The paper recommends stronger cybersecurity policies, investment in secure digital infrastructure, AI-supported security systems, and regular digital literacy training for staff and students. These measures aim to enhance institutional resilience and support the sustainable development of digital education across the region.

Keywords: *Digital Education, Cybersecurity, Artificial Intelligence, Higher Education, West Africa.*

320. Digital Entrepreneurship and Higher Education Transformation in Nigeria: Reimagining the Future of Higher Education in Nigeria

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The rapid expansion of digital technologies is reshaping economies, labor markets, and educational systems worldwide, creating new opportunities for innovation, entrepreneurship, and sustainable development. In Nigeria, the growing digital economy presents a unique opportunity for higher education institutions to transform their traditional roles from centers of knowledge transmission to hubs of innovation, enterprise creation, and skills development. This paper examines the relationship between digital entrepreneurship and higher education transformation in Nigeria, with a focus on how universities, polytechnics, and colleges of education can be reimagined to meet the demands of the Fourth Industrial Revolution and the knowledge-based economy. Drawing on contemporary literature, policy frameworks, and emerging trends in digital innovation, the study explores the role of digital entrepreneurship in fostering creativity, technological competence, job creation, and economic resilience among graduates. . The paper argues that embedding digital entrepreneurship within teaching, research, and community engagement can enhance graduate employability, stimulate innovation ecosystems, and strengthen institutional relevance in a rapidly changing world. The study therefore suggests that a transformative framework that emphasizes digital literacy, entrepreneurial education, industry-academia collaboration, innovation hubs, startup incubation, and supportive policy environments. It concludes that the future of higher education in Nigeria depends on its capacity to embrace digital transformation and cultivate entrepreneurial mindsets capable of driving inclusive economic growth and national development.

Keywords: *Digital Entrepreneurship, Higher Education Transformation, Digital Innovation, Entrepreneurship Education, Graduate Employability.*

321. Digital Goat Banking as an Empowerment Platform for Future-Ready African Higher Education Ecosystems

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African higher education institutions face linked challenges of unequal digital access and limited integration between academic learning and community livelihoods. This paper examines digital goat banking as a proposed platform for addressing both challenges. Digital goat banking combines a revolving livestock asset arrangement with accessible records, agreed transfer obligations and community oversight. A critical narrative review of livestock development, digital inclusion, living labs and service learning informs a conceptual framework for institution–community collaboration. The framework links goat husbandry and veterinary support with SMS or USSD access, offline-first ledgers and assisted community access points. It identifies opportunities for students in agriculture, ICT, business and social sciences to develop disciplinary and collaborative skills through supervised community projects. The synthesis indicates that livestock transfers require complementary services, digital access does not guarantee meaningful participation, and women's ownership of animals does not necessarily confer control over income or decisions. The paper proposes auditable asset records, community co-governance and separate indicators for animal survival, transfer fulfilment, women's agency and student competence. It does not report a completed digital goat-banking intervention or establish improvements in repayment, empowerment or employability. These remain outcomes for prospective evaluation. Digital goat banking offers a plausible living-lab approach to higher education engagement when animal welfare, equitable participation and sustained institutional support guide implementation.

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Keywords: *digital divide; goat banking; higher education; community empowerment; living labs*

322. Digital Inequality and Access to Higher Education in Nigeria: Social Studies Perspectives

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Digital technology has become increasingly important in expanding access to higher education, yet unequal access to digital resources continues to create significant educational disparities in Nigeria. This paper examines digital inequality and access to higher education in Nigeria from a Social Studies perspective. It focuses on how differences in

access to internet connectivity, digital devices, digital skills, electricity, and affordable digital services affect students' opportunities to participate effectively in higher education. The paper adopts a conceptual and qualitative approach, drawing on existing literature and relevant secondary sources to examine the social, economic, geographical, and institutional factors responsible for digital inequality. From a Social Studies perspective, digital inequality is viewed not merely as a technological challenge but as a social justice and inclusion issue that can reinforce existing inequalities among students from different socioeconomic backgrounds and geographical locations. The paper argues that students in rural and economically disadvantaged communities are more likely to experience barriers to digital access, thereby limiting their educational opportunities and participation in the emerging digital higher education ecosystem. It concludes that achieving equitable access to higher education requires policies that address affordability, infrastructure, digital literacy, electricity supply, and inclusive institutional practices. The paper recommends stronger collaboration among government, higher education institutions, communities, and the private sector to promote inclusive and sustainable digital access for all Nigerian students.

Keywords: *Digital inequality, higher education, digital access, social inclusion, Social Studies, Nigeria*

323. Digital Innovation and the Study of History in Tertiary Education in Nigeria

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The integration of digital innovation into tertiary education has transformed pedagogical approaches across disciplines, yet its impact on the study of history in Nigerian tertiary institutions remains under-examined. This study investigates how digital tools, platforms and resources are reshaping the teaching, learning and research of history in Nigerian tertiary institutions. A mixed-methods approach was used to collect data through questionnaires and in-depth interviews from history lecturers and students across federal and state tertiary institutions, where History is studied as a Course in Nasarawa State, Nigeria. The study examines the extent of adoption of digital technologies such as digital archives, online databases, GIS mapping, virtual museums, learning management systems and multimedia tools in history classrooms. Findings reveal that while there is growing awareness of digital innovation, adoption is uneven due to challenges including inadequate infrastructure, erratic power supply, limited digital literacy and poor funding. Despite these constraints, digital innovation has improved access to primary sources, enhanced students' engagements through interactive learning and enabled new historiographical methods. The study concludes that deliberate investment in ICT infrastructure, curriculum redesign and training are critical for maximizing the potentials of digital innovation in history education. It recommends policy reforms and collaborations between tertiary institutions, government and technology stakeholders to position history as a digitally relevant discipline in Nigeria's 21st-century education landscape.

Keywords: *Digital innovation, History education, Tertiary education, Nigeria, E-learning, Digital humanities.*

324. Digital Innovation in Federal Colleges of Education (Technical) in North Eastern Nigeria

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This study investigated the adoption, integration, and challenges of digital innovation in Federal Colleges of Education (Technical) across North Eastern Nigeria. As technical teacher education increasingly relies on modern technological frameworks to enhance pedagogical delivery and administrative efficiency, understanding the state of digital transformation in these specialized institutions becomes critical. A descriptive survey research design was adopted for the study. The population comprised all two Federal Colleges of Education (Technical) in Northeastern Nigeria, namely Federal College of Education (Technical), Potiskum and Federal College of Education (Technical), Gombe. Given the manageable size of the target population, a census sampling technique was utilized, capturing the total population of academic staff and ICT personnel across both institutions. Data were gathered using a structured questionnaire titled "Digital Innovation Assessment Questionnaire" (DIAQ) and analyzed using mean scores, standard deviations, and percentages. The study highlights the current state of digital infrastructure, key drivers of technology adoption, and significant barriers such as bandwidth constraints, power instability, and funding deficits limiting full digital integration. The findings underscore the urgent need for targeted intervention to foster robust digital ecosystems in technical teacher education. Consequently, the study recommends strategic public-private partnerships, continuous capacity-building programs for academic staff, and sustainable funding frameworks to institutionalize digital innovation within technical education in the region.

325. Digital Innovation Readiness and Sustainable Library Service Delivery in Colleges of Education in Southwest Nigeria

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The increasing integration of digital technologies into higher education has transformed the operations and service delivery mechanisms of academic libraries. This study investigates digital innovation readiness and sustainable library service delivery in colleges of education in Southwest Nigeria. The study examines the extent to which libraries are prepared to adopt and utilize emerging digital innovations, including cloud computing, artificial intelligence, institutional repositories, digital catalogues, and online information services. It further explores the relationship between digital innovation readiness and the sustainability of library services in meeting the information needs of students, lecturers, and researchers. A descriptive survey research design is proposed, targeting librarians and other relevant library personnel in selected colleges of education across Southwest Nigeria. Data will be collected using structured questionnaires and analyzed using descriptive and inferential statistics. The study is expected to reveal the level of digital infrastructure availability, staff competencies, institutional support, and funding mechanisms that influence digital innovation readiness. Findings may also indicate how readiness for digital innovation contributes to efficient, accessible, user-centered, and sustainable library service delivery. The study will provide empirical evidence for policymakers, institutional administrators, and library managers in developing strategies that enhance digital transformation and ensure the long-term sustainability of academic library services in Colleges of Education in Nigeria.

326. Digital Innovations and the Transformation of Higher Education in Nigeria: Opportunities, Challenges and Future Prospects

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Digital innovation has become a critical driver of transformation in higher education globally, offering new opportunities for teaching, learning, research, and institutional management. In Nigeria, the adoption of digital technologies in universities and other tertiary institutions has accelerated in response to growing demands for quality education, increased student enrolment, and the need for global competitiveness. This study examined the impact of digital innovation on higher education in Nigeria, focusing on the integration of e-learning platforms, digital libraries, virtual classrooms, learning management systems, and emerging technologies such as artificial intelligence and data analytics. The paper highlighted how these innovations enhance access to educational resources, improve teaching effectiveness, promote collaborative learning, and support administrative efficiency. Despite these benefits, challenges including inadequate infrastructure, limited internet connectivity, insufficient funding, digital literacy gaps, and cybersecurity concerns continue to hinder effective implementation. Using a review of existing literature and policy frameworks, the study evaluated the current state of digital transformation in Nigerian higher education and identified strategies for sustainable adoption. The findings suggest that increased investment in digital infrastructure, capacity building, and supportive policies is essential for maximizing the benefits of digital innovation. The study concludes that digital innovation remains a key catalyst for improving educational quality, accessibility, and institutional resilience in Nigeria.

327. Digital Innovations as Tools for Bridging the Digital Divide Advancing Research Outcomes in Nigerian Higher Education Institutions

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Digital technology is an off-shoot of computer technology that has produced profound impact on nations' education advancement. The global upsurge in the application of digital technologies has transformed higher education globally by enhancing teaching, learning, and research activities in the institutions of higher learning. Nonetheless, the digital divide remains a significant challenge in most developing countries, with the inclusion of Nigeria. The divide manifests by way of an unequal access to information and communication technologies (ICTs), internet connectivity reach, digital literacy, and weak or failed technological infrastructure. This paper examines the role of digital innovations in bridging the digital divide and for advancing research outcomes in Nigerian higher educational institutions like the

Colleges of Education. The study discusses fundamental digital innovations such as artificial intelligence (AI), cloud computing, digital libraries, open educational resources (OERs), learning management systems (LMS), big data analytics, and research collaboration platforms. The study highlights the opportunities provided by these technologies in enhancing research productivity, collaboration, knowledge dissemination, and academic excellence. The paper concludes that strategic investments by stakeholders in digital infrastructure, policy implementation, and human capacity building are essential for leveraging digital innovations to improving research outcomes and to reducing digital inequalities and bridging the divide in Nigerian higher education.

328. Digital Literacy as a Catalyst for Future-Ready Higher Education in Africa: Beyond Digital Access

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Globally, teaching, learning, research and knowledge dissemination have all changed as a result of the quick adoption of digital technology in higher education. To improve educational access and quality, governments and higher education institutions in Africa have made significant investments in digital infrastructure, online learning platforms and information and communication technology. Despite these efforts, there remain significant gaps between the accessibility of digital materials and the extent to which academic staff and students use them. This disparity emphasizes how crucial digital literacy is becoming as a necessary skill for engagement in modern higher education settings. The article highlights that having access to digital technology is not enough to bring about significant changes in education, using current research and policy texts. Instead, optimizing the advantages of technological investments in higher education requires the development of digital literacy competencies, such as information literacy, media literacy among others. In order to highlight current potential and difficulties related to the growth of digital literacy, the discussion places Nigeria within the larger African context. Inadequate training, unequal development of digital skills, infrastructure constraints, and gaps in policy implementation are some of the obstacles to the successful use of digital technology that are further examined in this study. It concludes that, to create learning environments that are resilient, inclusive, and innovative, African higher education institutions should make improvements in digital literacy a top priority. To close the gap between access and efficient use, the paper suggests comprehensive digital literacy frameworks, ongoing capacity-building programmes, curricular integration, and supporting institutional policies. African universities may better equip academics and graduates for the needs of an increasingly digital knowledge society by focusing on the development of digital competencies rather than just providing technology.

Keywords: *Digital Literacy, Catalyst, Future-Ready, Digita*

329. Digital Marketing Strategies and Social Media Influence in Hospitality and Tourism Development in Jos Plateau Nigeria

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The hospitality and tourism industry has undergone unprecedented digital transformation in the post-COVID-19 era, with digital marketing strategies and social media platforms becoming indispensable tools for enhancing destination competitiveness, customer engagement, and sustainable tourism development. This paper examines the influence of digital marketing strategies and social media on global transformation in hospitality and tourism development through a qualitative conceptual desk research methodology. Drawing on recent empirical studies published between 2022 and 2025, the paper explores how social media marketing, influencer marketing, artificial intelligence (AI), big data analytics, customer-generated content, search engine optimization (SEO), mobile marketing, and digital customer relationship management contribute to tourism growth and hospitality competitiveness. The study synthesizes current literature from reputable journals and international organizations to provide a comprehensive understanding of emerging digital marketing practices. Findings indicate that digital marketing significantly enhances destination branding, customer experience, business resilience, international visibility, and sustainable tourism development. Moreover, social media platforms facilitate real-time communication, electronic word-of-mouth (eWOM), customer engagement, and co-creation of tourism experiences, thereby influencing travelers' decision-making processes. The study concludes that effective adoption of digital marketing strategies has become a strategic necessity rather than a competitive advantage for hospitality and tourism organizations worldwide. The paper recommends increased investment in digital infrastructure, digital literacy, AI-powered marketing, ethical data management, and public-private partnerships to promote sustainable global tourism transformation.

Keywords: *Digital marketing, Social media, Hospitality industry, Digital transformation, Sustainable tourism, Electronic word-of-mouth (eWOM).*

330. Digital Pedagogyand Curriculum Innovation in Colleges of Education: Academic Staff Adoption, Challenges and Impact on Students' Learning Outcome

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Emerging technologies have rapidly changed higher education around the globe and has forced tertiary institutions to implement new teaching effectiveness to enhance students' learning outcome. The study examined academic staff adoption levels, challenges and perceived impact on students' learning outcome of digital pedagogy and teaching innovation in Nigeria Colleges of Education. The researcher used a mixed-method survey design covering 1200 academic staff and 480 qualitative participants. Results suggest that adopting digital pedagogy predict positive students' engagement, performance, critical thinking and collaboration. Thematic findings indicate that teaching innovation makes learning flexible and personalized along with interactive classroom teaching. Digital pedagogy has the potentials for a greater higher education in Nigeria, the study finds. It is recommended that the government allocate more resources to digital infrastructure, build institutional capacity, provide continuous professional development for lecturers, as well as put in place policies that promote inclusive and sustainable digital learning ecosystems.

Keywords: *Digital pedagogy, Teaching innovation, Colleges, Academic staff adoption, Students' learning outcome.*

331. Digital Skills Acquisition and Graduate Employability in Nigeria: the Role of Higher Education in Achieving SDG 8 (Decent Work and Economic Growth)

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In Nigeria's rapidly evolving digital economy, a widening gap exists between higher education outcomes and the demands of the modern labour market. This mismatch significantly hinders youth employment and stalls national progress toward United Nations Sustainable Development Goal 8 (Decent Work and Economic Growth). This study therefore investigates the impact of digital skills acquisition on graduate employability in Nigeria, specifically examining how higher education institutions serve as originators for sustainable economic integration. A quantitative research design was adopted for the study. Data were collected through a structured questionnaire administered to a purposively sampled group of recent Nigerian graduates and corporate employers. The collected data were analyzed using descriptive statistics and regression analysis to determine the relationship between digital competencies and employment outcomes. Findings from the study revealed a positive correlation between advanced digital literacy such as data analytics, digital marketing and software literacy and accelerated graduate employment. However, the data also revealed severe institutional challenges, with a high percentage of respondents indicating that obsolete university curricula and inadequate technological infrastructure in the school hindered their skill acquisition. The study concludes that while digital competencies are critical for workforce readiness, the current situation of the Nigerian higher education sector is structurally under-equipped to systematically deliver these skills to graduates. It was therefore recommended that urgent curriculum modernization, mandatory ICT integration, and targeted funding for digital infrastructure across Nigerian higher education institutions to transform graduates from job seekers into employable assets.

332. Digital transformation and digital inclusion in teacher education: Bridging the digital divide in Nigerian colleges of education

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Digital transformation has become a critical driver of educational innovation globally, reshaping pedagogical practices, learning environments, and teacher preparation programs. In Nigeria, efforts to integrate digital technologies into teacher education have intensified; however, persistent digital inequalities continue to hinder equitable access to technology enhanced learning opportunities within colleges of education. The digital divide, manifested through disparities in infrastructure, connectivity, digital competencies, and resource allocation, poses significant challenges to the preparation of future teachers capable of functioning effectively in technology driven educational systems. This

study explored stakeholders' perceptions and experiences regarding digital transformation and the challenges associated with the digital divide in colleges of education in Nigeria. Guided by a qualitative research approach, data were collected through semi-structured interviews and focus group discussions involving lecturers, administrators, and student teachers drawn from selected colleges of education. The data were analyzed using thematic analysis. Findings revealed that inadequate digital infrastructure, unreliable internet connectivity, insufficient digital competencies among educators, funding limitations, and pronounced disparities between urban and rural institutions significantly constrained the implementation of digital transformation initiatives. Nevertheless, participants identified emerging opportunities, including digital literacy programs, professional development initiatives, institutional partnerships, and evolving policy reforms aimed at enhancing technology integration in teacher education. The study concluded that bridging the digital divide is essential for the sustainable future of teacher education in Nigeria. Strategic investments in digital infrastructure, continuous capacity building programs, and inclusive policy frameworks are necessary to ensure equitable access to digital learning resources and opportunities. The findings provide important implications for educational policymakers, teacher educators, and institutional administrators seeking to strengthen digitally responsive teacher education systems in developing country contexts.

Keywords: *digital transformation, digital divide, teacher education, digital inclusion*

333. Digital Transformation and Human Capital Development in Africa: Does Digital Access Improve the Economic Returns to Higher Education?

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The rapid diffusion of digital technologies is transforming the process through which human capital is acquired, utilized and translated into economic productivity across Africa. Although higher education is widely recognized as an important source of human capital development, limited digital connectivity may constrain the ability of educated workers and economies to fully realize its economic benefits. This study examines whether digital access enhances the economic returns to higher education in Africa. The study specifically investigates the direct effects of higher education and digital access on economic performance and whether digital connectivity strengthens the contribution of higher education to economic productivity. The study employs panel data for selected African countries covering the period 2000 to 2024. Higher education is measured using tertiary education enrolment, while digital access is proxied by the proportion of individuals using the Internet. Economic returns to higher education are captured using labour productivity, while GDP per capita, foreign direct investment and urbanization are included as control variables. The study specifies an interaction term between higher education and digital access to examine whether digital connectivity conditions the economic contribution of higher education. Panel unit root and cointegration tests are conducted to establish the long run properties of the variables. The empirical analysis employs the Panel ARDL pooled mean group estimator, while Panel FMOLS is used as robustness checks. The study contributes to literature by examining digital access as a potential mechanism through which higher education generates stronger economic returns rather than treating education and digitalization as independent determinants of development. The findings are expected to provide evidence relevant to policies on digital infrastructure, higher education investment, digital skills development and human capital formation in Africa.

Keywords: *Digital transformation, higher education, human capital, digital access, labour productivity, Africa.*

334. Digital Transformation and Quality Enhancement in Higher Education: The Role of Digital Learning Platforms

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The rapid advancement of digital technologies has significantly transformed the delivery and management of higher education worldwide. Digital platforms have emerged as important tools for improving teaching and learning, expanding access to educational resources, enhancing student engagement, and supporting effective academic administration. This paper examines how digital platforms can contribute to the transformation and improvement of quality in higher education. It explores the use of learning management systems, virtual classrooms, digital libraries, online assessment tools, artificial intelligence, and other technology-enabled platforms in promoting flexible, student-centred, and collaborative learning environments. The paper further considers the benefits of digital platforms, including improved accessibility, personalised learning, efficient communication, timely feedback, and opportunities for continuous learning. However, challenges such as inadequate digital infrastructure, limited digital

literacy, cybersecurity concerns, unequal access to technology, and resistance to technological change may hinder effective implementation. The paper argues that achieving sustainable improvements in higher education quality requires strategic investment in digital infrastructure, capacity building for lecturers and students, appropriate institutional policies, and continuous evaluation of digital learning practices. It concludes that, when effectively integrated into institutional and pedagogical practices, digital platforms can serve as powerful instruments for enhancing the quality, accessibility, efficiency, and relevance of higher education in the digital era.

Keywords: *Digital transformation, quality, digital learning platforms*

335. Digital Transformation and Smart Learning Ecosystems in Business Education Programmes: Institutional Strategies for Enhancing Innovation and Workforce Readiness

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The implementation of digital transformation and smart learning ecosystems is key to change higher education and learners' readiness for the digital economy, which has contributed to growing investments in educational technologies. This paper provides an empirical investigation of the influence of digital infrastructure and institutional support on innovation capability and workforce readiness among business education students. The data were collected from business education students using both structured questionnaires and interviews. The study adopted multi-stage sampling techniques to ensure increased representation, validity, and generalization of its findings. The outcomes of the study from both inferential statistics and thematic analysis revealed that digital transformation and smart learning ecosystems contribute to learner-centeredness, innovative capability, and workforce readiness skills among business education students. The study provides valuable insights for practical policy implications that will help in narrowing the digital divide and contributing to the sustainable development of human capital in Africa.

336. Digital Transformation and Strategic Management in Higher Education Institutions in Africa: A framework for Building Future-Ready Universities

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The rapid advancement of digital technologies is transforming the way higher education institutions operate, deliver academic services, manage resources, and engage with students and other stakeholders. However, many higher education institutions in Africa continue to face challenges such as inadequate digital infrastructure, limited financial resources, shortage of digital skills, and resistance to organizational change, and weak institutional strategies for technology adoption. These challenges have created a digital divide that may affect the ability of African universities to develop future-ready education ecosystems. This study examines the role of strategic management in facilitating digital transformation in higher education institutions in Africa. The study focuses on how institutional leadership, digital governance, staff capacity development, investment in digital infrastructure, change management, and stakeholder's engagement can contribute to successful digital transformation. A conceptual approach is adopted to examine the relationship between strategic management practices and institutional digital readiness. The study proposes a strategic management framework that integrates leadership commitment, technology investment, human resource development, digital governance, innovation, and continuous evaluation as key components of digital transformation. The study argues that digital transformation should not be viewed merely as the acquisition of technology but as an organizational transformation requiring effective strategic planning, leadership, policy development, and change management. The proposed framework can assist university managers and policymakers in developing sustainable digital strategies that improve institutional efficiency, teaching and learning, research, student services, and accessibility. The study concludes that effective strategic management is essential for bridging the digital divide and building resilient, inclusive, innovative, and future-ready higher education institutions in Africa.

Keywords: *Digital Transformation, Strategic Management, Higher Education, Digital Leadership, African Universities, Digital Governance, Innovation.*

337. Digital Transformation and Sustainable Development Goals: The Role of Africa higher Education

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Digital transformation has emerged as a critical driver of sustainable development, reshaping educational systems and creating new opportunities for innovation, inclusion, and socioeconomic progress. In Africa, higher education institutions are increasingly recognized as strategic actors in achieving the Sustainable Development Goals (SDGs) through the adoption of digital technologies in teaching, learning, research, and institutional management. Despite significant advancements, many African universities continue to face challenges such as inadequate digital infrastructure, limited internet connectivity, insufficient funding, digital skills gaps, and unequal access to technological resources. This paper examines the role of digital transformation in advancing the SDGs within the context of African higher education. Drawing on existing literature and policy frameworks, the study explores how digital technologies, including artificial intelligence, cloud computing, learning management systems, big data analytics, and virtual learning platforms, contribute to improving educational quality, promoting gender equality, reducing inequalities, fostering innovation, and enhancing employability. The paper further analyzes the barriers limiting the effective integration of digital technologies and highlights emerging opportunities for building resilient and future-ready higher education ecosystems. It argues that strategic investments in digital infrastructure, capacity building, policy reforms, and multi-stakeholder partnerships are essential for maximizing the developmental impact of higher education institutions across the continent. The study concludes that a digitally transformed higher education sector is indispensable for accelerating Africa's progress toward the SDGs and ensuring sustainable, inclusive, and knowledge-driven development in the twenty-first century.

Keywords: *Digital Transformation, Sustainable Development Goals (SDGs), Higher Education, Artificial Intelligence, Digital Inclusion.*

338. Digital Transformation and Technology Integration in African Universities: The Nigerian Example

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African tertiary educational institutions are indeed facing an existential threat to either evolve from traditional knowledge sharing and become engines of innovation and sustainable development or be overtaken by ongoing digital transformation and technology integration. Therefore, this research explores the pace, opportunities, enablers, and challenges of digital transformation and technology integration in Nigerian public universities as practical cases for the African context. While adopting the twin theoretical frameworks of the Technology-Organization-Environment (TOE) and the Diffusion of Innovation which are together explaining how technology capabilities, institutional readiness and external factors influence use and integration of digital tools in education and governance, the study uses a qualitative research method to examine the extent of this digital transformation and technology integration in the country's public universities. The findings of this research, in fact, reveal that Nigeria has made significant progress through several interventions by the National Universities Commission (NUC), Tertiary Educational Trust Fund (TETFund) and through the Public-Private Partnership (PPP) Model despite persistent challenges. As part of its recommendations, this research has advocated that African universities should be intentional while adopting digital transformation and technology integration in pedagogy, research commercialization, and institutional governance. Thus, the whole essence of this paper is to contribute to the conference's theme by presenting how Nigerian public universities can better leverage digital tools, enhance technology innovation, and extend their quality access to all in order to align with the SDGs and Africa's knowledge-based economic vision of the African Union's Agenda 2063.

339. Digital Transformation for Quality Instruction in Federal College of Education (Technical), Isu, Ebonyi State, Nigeria

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This study focuses on digital transformation for quality instruction in the Federal College of Education (Technical), Isu, Ebonyi State, Nigeria. This research adopted a descriptive survey design, and the instrument for data collection was the researcher's made structured questionnaire. The instrument was face-validated by three experts. The reliability of the instrument was established using the test-retest method and application of Pearson's product-moment correlation, which yielded a reliability index of 0.69. The data was analysed using mean and standard deviation. The findings of this study revealed, among others, that very few lecturers utilise digital devices and platforms in their instructions in colleges of education. Based on the findings of the study, many recommendations were made, amongst which was that lecturers in higher institutions of learning, especially colleges of education, should utilise digital devices and platforms

in the instructions.

340. Digital Transformation in African Higher Education: Developing the Digital Entrepreneurship and Financial Inclusion Framework (DEFIF) for Sustainable Innovation and Inclusive Growth

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Digital transformation has become a strategic driver of innovation, entrepreneurship, and sustainable socio-economic development in higher education. However, research on digital transformation, entrepreneurial universities, artificial intelligence (AI), innovation ecosystems, financial technology (FinTech), and financial inclusion remains fragmented, particularly within the African higher education context. This study addresses this gap by developing an integrated conceptual framework linking digital transformation, entrepreneurship development, and international financial inclusion, while proposing a strategic roadmap for transforming African universities. The study employs a Systematic Literature Review (SLR) guided by the PRISMA 2020 framework. Peer-reviewed publications published between 2015 and 2026 were systematically identified, screened, and synthesized using thematic analysis to examine the interrelationships among digital transformation, entrepreneurial universities, AI, innovation ecosystems, FinTech, and financial inclusion. The findings reveal that digital transformation extends beyond technology adoption to encompass organizational capabilities, strategic leadership, institutional governance, curriculum innovation, research commercialization, digital infrastructure, and university–industry collaboration. Digitally transformed universities are better positioned to promote digital entrepreneurship, startup creation, innovation ecosystems, graduate employability, and financial inclusion through AI-driven innovation, FinTech-enabled financial services, and cross-border entrepreneurial finance. Based on these findings, the study develops the Digital Entrepreneurship and Financial Inclusion Framework (DEFIF) and proposes the African Digital University Transformation Roadmap (2026–2035) as a phased implementation strategy involving governments, universities, industry, financial institutions, and development partners. The study contributes by integrating the Resource-Based View, Dynamic Capability Theory, Human Capital Theory, Technology Acceptance Model, and Triple Helix Model into a unified analytical framework. It also bridges the literature on digital transformation, entrepreneurship, innovation, and international financial inclusion while offering evidence-based policy recommendations for strengthening digital infrastructure, AI integration, entrepreneurship education, innovation ecosystems, and inclusive financial systems. The study concludes that digital transformation is a strategic pathway for building entrepreneurial universities, expanding financial inclusion, enhancing graduate employability, and fostering sustainable and inclusive economic growth across Africa.

Keywords: *Digital Transformation; Entrepreneurial Universities; Artificial Intelligence; Innovation Ecosystems; FinTech; Financial Inclusion; Higher Education; Africa.*

341. Digital Transformation in Higher Education

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Digital transformation has become a strategic imperative for higher education institutions globally, driven by advances in technology, changing student expectations, and disruptions such as the COVID-19 pandemic. This study examines the impact of digital transformation on teaching, learning, and institutional operations in higher education. Adopting a mixed-methods research design, data were collected through a survey of 450 academic staff and students across three universities, supplemented by semi-structured interviews with 12 institutional leaders. Quantitative data were analyzed using descriptive statistics and regression analysis, while thematic analysis was applied to qualitative data. Findings reveal that digital transformation significantly enhances access to learning resources, improves student engagement, and increases operational efficiency. However, challenges including inadequate digital infrastructure, low digital literacy among faculty, and resistance to change were identified as major barriers. The study concludes that effective digital transformation in higher education requires investment in infrastructure, targeted digital skills training, and supportive institutional policies. Recommendations are made for university management to adopt a holistic, student-centered approach to digital transformation to ensure equitable and sustainable outcomes.

Keywords: *digital transformation, higher education, e-learning, educational technology, digital literacy*

342. Digital Transformation in Higher Education

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Digital transformation has emerged as a pivotal force in reshaping higher education globally. It involves the strategic integration of digital technologies into teaching, learning, research, administration, and institutional management to enhance efficiency, accessibility, and educational outcomes. The increasing adoption of technologies such as artificial intelligence, cloud computing, big data analytics, learning management systems, and virtual learning environments has revolutionized traditional educational practices and expanded opportunities for flexible and personalized learning. This paper examines the concept, drivers, opportunities, and challenges of digital transformation in higher education. It highlights how digital technologies facilitate innovative pedagogical approaches, improve student engagement, support data-driven decision-making, and strengthen institutional competitiveness in a rapidly evolving knowledge economy. The study also explores challenges associated with infrastructure deficits, digital literacy gaps, cybersecurity concerns, resistance to change, and issues of equity and inclusion, particularly in developing countries. The paper argues that successful digital transformation requires visionary leadership, robust technological infrastructure, continuous capacity building, and supportive policy frameworks. It concludes that while digital transformation presents significant opportunities for improving the quality, accessibility, and sustainability of higher education, its effectiveness depends on strategic planning and stakeholder commitment. Institutions that embrace digital innovation are better positioned to meet the demands of the twenty-first-century educational landscape and contribute meaningfully to societal development.

Keywords: *Digital Transformation, Higher Education, Educational Technology, E-Learning, Digital Innovation, Artificial Intelligence, Institutional Development.*

343. Digital Transformation in Higher Education: Case of Soroti University, Uganda

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Digital transformation is increasingly becoming a strategic imperative for higher education institutions seeking to improve the quality, accessibility, efficiency and resilience of teaching, learning, research, innovation, community outreach and institutional administration. However, universities in developing contexts continue to face challenges including inadequate digital infrastructure, fragmented information systems, limited automation, cybersecurity risks, constrained resources, digital skills gaps and the need for effective institutional governance. This paper presents the case of Soroti University, Uganda, and its approach to digital transformation as a strategic pathway towards becoming a more digitally enabled and future-ready university.

The study examines the University's current digital environment and presents its Digital Transformation Agenda 2026-2030, developed to provide a coordinated framework for transforming institutional processes and services. The current state indicates that university-wide business process automation is approximately 40 percent, with varying levels of digitalisation across academic, administrative and support functions. The transformation agenda seeks to increase institutional automation to 80 percent by 2030, while strengthening ICT infrastructure, cybersecurity, digital services, data management, systems integration and digital capabilities.

The paper proposes a holistic digital transformation approach built around six interconnected dimensions: digital infrastructure and connectivity; digitalisation and automation of institutional processes and services; integrated information systems and data management; cybersecurity and ICT governance; digital teaching, learning and research, and innovation; and digital partnerships. The approach recognises that digital transformation extends beyond the acquisition of technologies and requires institutional leadership, policy frameworks, process re-engineering, capacity development, stakeholder participation, sustainable financing and continual improvement.

Particular attention is given to the role of the Directorate of ICT Services (DICTS) of the University in planning, designing, implementing, securing, monitoring and maintaining the University's ICT infrastructure and digital services. The paper further explores opportunities for emerging technologies, including artificial intelligence, smart-campus technologies, cloud services, digital platforms and data-driven decision-making, while emphasising responsible adoption, information security, privacy and institutional sustainability.

Using Soroti University as a case study, the paper contributes an institutional perspective from a developing African university on how a structured digital transformation agenda can support the transition from fragmented digital initiatives towards an integrated, secure and service-oriented digital university ecosystem. The proposed approach provides lessons that may be adapted by other African higher education institutions pursuing sustainable digital

transformation within resource-constrained environments.

Keywords: *Digital transformation; higher education; digitalisation; smart university; ICT governance; cybersecurity; automation; artificial intelligence; Soroti University; Uganda*

344. Digital Transformation in higher education: Enhancing the teaching of Physics in tertiary institutions in Nigeria

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Due to global phenomena worldwide, digital transformation has reshaped higher education globally, particularly in science disciplines like Physics, which have a much higher analytical advantage through additional/digital tools for experimentation, visualization, and modeling. This paper explores digital transformation in Physics teaching at higher level, addressing technologies like Learning Management Systems (LMS), virtual laboratories, simulations, artificial intelligence, cloud computers and collaborative tools. It also covers benefits, challenges and implementation. Finally, with adequate infrastructural support, digital transformation can greatly enhance student engagement and understanding thereby increasing accessibility to quality education along with improving academic performance, provided there is sufficient infrastructure, training, and institutional support.Keywords: Digital transformation; Physics education; tertiary institutions; digital tools and technologies.

345. Digital Transformation in Higher Education: Institutional Strategies, Digital Infrastructure, and Smart Campus Ecosystems for Sustainable Academic Innovation and Transformation

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This study will examine digital transformation in higher education, focusing on institutional strategies, digital infrastructure, and the development of smart campuses as key drivers of sustainable academic innovation. It will explore how higher education institutions will formulate and implement strategic policies that will integrate digital technologies into teaching, learning, research, and administrative processes. The study will assess the role of leadership, governance structures, and organizational culture in ensuring effective and inclusive digital transformation.The research will further investigate the importance of digital infrastructure, including broadband connectivity, cloud-based systems, learning management systems, and data analytic tools, in supporting institutional transformation. It will analyze how these technologies will enhance access to quality education, improve instructional delivery, and promote collaborative and flexible learning environments. Attention will also be given to how institutions will leverage digital tools to strengthen research capacity and institutional efficiency. In addition, the study will examine smart campuses as an emerging concept that will utilize Internet of Things (IoT), artificial intelligence, and automation to optimize campus operations, improve security, and enhance student engagement and experience. It will identify potential challenges such as inadequate funding, digital inequality, cybersecurity threats, and resistance to technological change. The study will propose strategic recommendations to address these challenges and will develop a comprehensive framework to guide digital transformation initiatives. Ultimately, it will demonstrate how aligning institutional strategies with advanced digital infrastructure and smart campus innovations will enable higher education institutions to remain competitive and responsive to future demands.

346. Digital Transformation in Nigerian Higher Education: Implications for Educational Planning, Policy Development, and Equitable Access

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Digital transformation is redefining higher education by changing how universities deliver teaching, manage institutional processes, and expand educational opportunities. In Nigeria, the growing adoption of digital technologies presents new possibilities for improving educational planning, policy implementation, and equitable access, despite persistent infrastructural and socioeconomic challenges. This study examines the state of digital transformation in Nigerian higher education by analyzing current evidence on the adoption of learning management systems, artificial intelligence, open and distance learning, cloud-based platforms, and national digital education initiatives. The evidence

is synthesized to evaluate their implications for educational planning, policy development, and equitable access. The findings indicate that digital transformation has strengthened technology-enabled teaching, learning, and institutional administration while exposing persistent challenges related to infrastructure deficits, inadequate funding, digital literacy gaps, weak policy implementation, and regional and gender inequalities. The study further identifies the need for integrated planning approaches that align digital infrastructure, human capacity development, curriculum innovation, and policy implementation to achieve sustainable digital transformation. Sustainable digital transformation in Nigerian higher education requires coordinated planning, strengthened policy implementation, strategic investment in digital infrastructure and capacity building, and deliberate interventions that promote equitable access across institutions and learner groups. These measures provide practical directions for educational planners, university administrators, regulatory agencies, and policymakers seeking to build an inclusive and resilient higher education system.

347. Digital Transformation of Geological Field Education: The Role of Virtual Field Trips and Geospatial Technologies

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Geological field education plays a crucial role in developing students' observational, analytical, and interpretive skills. However, challenges such as financial constraints, safety concerns, environmental restrictions, and limited access to field sites have encouraged higher education institutions to adopt digital approaches to field-based learning. This study examines the role of Virtual Field Trips (VFTs) and geospatial technologies in enhancing geological field education and supporting the digital transformation of higher education. A mixed-methods approach was employed, involving surveys, interviews, and learning assessments among geology students and instructors. The study evaluated the use of digital tools such as Geographic Information Systems (GIS), remote sensing applications, digital elevation models, and interactive three-dimensional geological visualizations in teaching and learning. Quantitative and qualitative data were analyzed to assess the educational effectiveness of these technologies. The findings indicate that VFTs and geospatial technologies enhance students' understanding of geological concepts, improve spatial reasoning skills, and strengthen their ability to interpret geological structures and landscapes. The technologies also increase access to diverse geological environments while reducing the costs and logistical challenges associated with traditional field excursions. Participants reported greater engagement, flexibility, and readiness to use digital tools in professional geoscience practice. However, challenges related to inadequate technological infrastructure, limited digital competencies, and reduced opportunities for hands-on field experience remain significant concerns. The study concludes that virtual field trips and geospatial technologies are valuable complements to conventional fieldwork. Their integration into geology curricula can improve learning outcomes, expand educational access, and better prepare students for the demands of a digitally driven geoscience profession. Hybrid learning models combining physical and virtual field experiences are therefore recommended.

Keywords: *Digital Transformation, Geological Field Education, Virtual Field Trips, GIS, Remote Sensing, Higher Education.*

348. Digital Transformation of University Operations in Nigeria: Beyond E-Learning

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Discourse on educational technology in Nigeria has been dominated by e-learning: learning management systems, virtual classrooms, and online course delivery. This narrow framing obscures a broader and arguably more consequential shift now underway in Nigerian universities — the digitalization of the administrative, financial, governance, and infrastructural systems that keep institutions running. This paper examines digital transformation in Nigerian university operations beyond the classroom, covering enterprise resource planning (ERP) systems, integrated personnel and payroll platforms, admissions and records management, financial administration, library and research information systems, and cybersecurity and data governance. Drawing on published empirical and policy literature, the paper argues that Nigerian universities are undergoing a fragmented, top-down, and unevenly resourced transformation driven substantially by federal mandates such as the Integrated Personnel and Payroll Information System (IPPIS) and the Treasury Single Account, rather than by institution-led strategic planning. While these interventions have improved transparency and reduced certain forms of payroll fraud, they have also generated friction with the peculiarities of university employment structures, exposed persistent infrastructural and cybersecurity gaps, and left a wide implementation gap between well-resourced and poorly-resourced institutions.

The paper concludes with a set of recommendations for a more coherent, institution-anchored approach to digital transformation of university operations in Nigeria.

349. Digital Transformation Strategies for College of Education in Africa Developing Smart-Campus Solution for a Future-Ready Higher Education Ecosystem

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The rapid advancement of digital technologies is reshaping higher education globally, creating new opportunities for innovation, efficiency, and improved learning outcomes. However, many Colleges of Education in Africa continue to face significant challenges, including inadequate digital infrastructure, limited access to technological resources, insufficient digital literacy among stakeholders, and widening disparities in educational access. This paper examines strategic approaches to digital transformation in Colleges of Education through the development of smart campus solutions that support a future-ready higher education ecosystem.

The study explores the integration of emerging technologies such as cloud computing, artificial intelligence, learning management systems, Internet of Things (IoT), digital libraries, and data-driven decision-making platforms to enhance teaching, learning, research, and administrative processes. It highlights how smart campus initiatives can improve institutional efficiency, strengthen academic delivery, promote collaborative learning, and provide flexible access to educational resources for students and staff.

Using a conceptual and policy-driven approach, the paper identifies critical success factors for sustainable digital transformation, including leadership commitment, strategic planning, capacity building, infrastructure development, cybersecurity, and stakeholder engagement. The study further proposes a framework for implementing smart campus solutions tailored to the unique socio-economic realities of African higher education institutions.

The paper concludes that adopting comprehensive digital transformation strategies is essential for Colleges of Education to bridge the digital divide, foster innovation, and prepare graduates with the digital competencies required for the twenty-first-century knowledge economy.Keywords: Digital Transformation, Smart Campus, Colleges of Education, Higher Education Ecosystem, Digital Infrastructure, Educational Technology, Africa, Future-Ready Education.

350. Digital Transformation, Higher Education and Youth Employment Nexus in Nigeria: A Quantile Analysis

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This study examines the impact of digital transformation and higher education on youth employment in Nigeria. The study uses time series data from various sources. The ordinary least squares (OLS) method and quantile regression analysis were used to analyze the data. The outcomes of the regression analysis at the mean level and at different quantiles revealed a negative impact of digital transformation and higher education on youth development in Nigeria. However, the interaction term between higher education and digital transformation revealed that the creation of youth employment through digital transformation depends largely on the level of higher education at the mean level, as well as at the lower and upper quantiles. The study therefore recommends, among other things, the interaction between digital transformation and higher education for higher youth employment generation in Nigeria.

Keywords: *Digital transformation, higher education, youth employment, quantile regression*

351. Digitalizing Record Management in Colleges of Education in Nigeria: Issues and Challenges

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Records are critical to the effective and efficient Management of educational institutions. This paper discusses the relevance of digital technology in the task of record management in Colleges of Education in Nigeria. concepts of School records, objectives, significance of school records and other related concepts were synoptically reviewed. The paper further looked at the need to digitalize record management in Colleges of Education in Nigeria. In addition, the paper examined the issues and challenges facing effective digitalization of record management in Colleges of Education in

Nigeria. These issues and challenges include: low technical capacity, inadequate availability of ICT facilities and poor perception of digital technology by staff among others. The paper concluded that for effective integration of digital technology in record management in Colleges of Education, these issues and challenges must be curtailed. Thus, to overcome the above issues and challenges, the paper recommended among others that there should be vigorous ICT training for personnel in Colleges of Education, the need to support the colleges with more ICT materials as well as policy direction and sensitization to ensure that staff whole-heartedly embrace the adoption of ICT or digital technology in record Management in Colleges of Education in Nigeria.

352. Does the kind of upskilling matter? Training access, skills relevance, continuous learning and workforce transition success among commercial bank employees in Bayelsa State, Nigeria

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Nigerian banks are changing rapidly via technological channels and regulatory recapitalization programs. and their employees are expected to change with them. This study examined how three features of employer or organisation provided upskilling and reskilling influence how successful employees transit through such changes by intending to stay, move into new roles inside the bank, and hold a career that remains viable. A cross-sectional survey was carried out among employees of commercial banks in Bayelsa State, Nigeria. 285 questionnaires were retrieved out of 327 sampled employees (87.2%). Five-item scales were reliable (Cronbach's α = .78 to .87). Nine hypotheses were tested with Pearson correlations. Every relationship was positive and statistically significant ($p \leq .001$), yet differed in size. Training accessibility was most strongly related to career sustainability ($r = .58$), and continuous learning and training accessibility were similarly related to job retention ($r = .48$ and $.45$). Relationships with internal mobility were weak for all three dimensions ($r = .19$ to $.26$), partly because almost every respondent rated mobility highly. The results suggest that development practices do not serve every transition goal equally, and that banks wanting to move staff into new roles need internal career systems as well as training. The design is correlational and based on self-reports, so the findings describe association, not cause.

Co-authors: *Tonbra Baridei*

Keywords: *upskilling; reskilling; workforce transition; job retention; internal mobility; career sustainability; banking; Nigeria*

353. Effect of Digital and Innovation on Academic Research Development in Nigeria Colleges of Education

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Incorporating research and development into college system has made it a turning point in institutional achievement and global identification. The study examined the impact of research and development in showcasing college digital transformation and innovation among 200 public college of education academics randomly selected from the selected public colleges of education in South West region during the academic session 2024-2025. The study explored a descriptive correlational survey. Data was collected through research-made questionnaires and were statistically analysed utilising Mean and Standard Deviation, Pearson Product Correlation Coefficient and Regression Analysis. Result showed a very high grade of academic digital transformation, a very high grade of academic innovation, and a very high grade of research and development in public colleges of education. There is a significant relationship between academic digital transformation, academic innovation and as well as research and development. Research. Incorporating research in teaching and data -driven decision -making were observed to be predictors of academic digital transformation.

Keywords: *Digital transformation, Innovation, Research, Development, Learners involvement*

354. Energy Prices, Exchange Rate Dynamics and Inflation in Nigeria: Evidence from a Structural VAR Model

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Inflation dynamics in energy-dependent economies remain a subject of ongoing debate, particularly with regard to the relative roles of energy prices, exchange rate movements, and monetary policy. This study examines the dynamic relationship between energy prices, exchange rate movements and inflation in Nigeria using a structural vector autoregression (SVAR) model. The analysis is based on monthly data spanning January 1990 to June 2025 and incorporates key macroeconomic variables, including domestic petrol prices, Brent crude oil prices, exchange rate, money supply, output gap and monetary policy rate. The analysis integrates linear, nonlinear, and structural break unit root tests to establish the time series properties of the variables, followed by impulse response functions and forecast error variance decomposition to assess dynamic interactions. The results indicate that domestic petrol price shocks exert the strongest and most immediate influence on inflation, while Brent crude oil price shocks affect inflation through indirect channels, including exchange rate adjustments. Exchange rate movements also contribute to inflation dynamics, although their effect remains moderate relative to domestic energy prices. In contrast, monetary policy shocks produce limited and short-lived responses, indicating weak transmission in the presence of dominant supply-side pressures. Variance decomposition results show that inflation is initially driven by its own persistence, but energy price shocks, particularly domestic petrol prices, account for the largest share of forecast error variance over time. These findings suggest that inflation in Nigeria is largely structural in nature and driven by external and cost-related factors rather than demand conditions. The study concludes that effective inflation management requires a coordinated policy approach that goes beyond monetary tightening. Policy priorities should include stabilisation of domestic fuel prices, improved exchange rate management, and structural reforms aimed at reducing production costs and external vulnerabilities.

Keywords: *Inflation dynamics; Energy prices; Exchange rate; Structural VAR; Nigeria*

355. Enhancing Sustainable Physics Education through Digital Transformation Opportunities and Challenges for Nigerian Higher Education

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Physics Education plays a critical role in developing the scientific and technological competencies required for sustainable national development. However, the evolving digital landscape has transformed the delivery of Science Education, creating both opportunities and challenges for Higher Education institutions in Nigeria. This review paper examines the potential of digital transformation to enhance sustainable physics education through the integration of emerging technologies such as artificial intelligence, virtual laboratories, simulations, learning management systems, and open educational resources. Drawing on contemporary literature, the paper explores how these innovations can improve conceptual understanding, promote learner engagement, facilitate flexible learning, and expand access to quality physics education. The review also highlights key challenges hindering effective digital integration, including inadequate infrastructure, unreliable electricity supply, limited internet connectivity, insufficient funding, and gaps in digital literacy among educators and students. The paper argues that addressing these barriers through strategic investment, policy support, and capacity-building initiatives is essential for building resilient and future-ready higher education ecosystems. It concludes that digital transformation offers a viable pathway for advancing sustainable physics education and strengthening scientific capacity in Nigeria.

356. Extent of awareness of assistive technologies for students with special needs in selected tertiary institutions ' libraries in South-East, Nigeria

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ABSTRACT Globally, the integration of assistive technologies has been recognized as central to inclusive education. Libraries play a vital role in supporting academic success and consequently understanding the types of students with special needs and their specific requirements is essential for planning library services. This study will examine the extent of awareness of assistive technologies and the provision of library services to students with special needs in selected tertiary institutions' libraries in South-East, Nigeria. Three research questions and hypotheses respectively will guide the study. A survey research design will be adopted for the study. The population of the study will comprise 211 respondents in tertiary institutions libraries. A structured rating scale and an observational checklist titled: Extent of Awareness of Assistive Technologies for Students with Special Needs in tertiary institutions Libraries in South-East,

Nigeria (EAATSSN) will be used to collect data for the study. Data collected will be analyzed using descriptive and inferential statistics. Mean and standard deviation will be used to answer research questions, while chi-square and t-test statistics will be used to test the hypotheses at the 0.05 level of significance.

Keywords; Assistive Technologies, Libraries, Tertiary institutions, students with special needs .

357. Factors influencing personal hygiene practice in higher education among female students in Aminu Saleh college of education Azare

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358. Fostering Innovation In Higher Education Institutions For Socio-economic Jet Stage Transformation In Africa

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Higher Education Institutions all over the world are positioned as the central hubs for transforming any country from analog stage of development to digital stage. The aim of this study is to ascertain means of fostering innovation in higher education institutions with a view of transforming Africa into an efficient and sustainable socio-economic jet stage development. The data for this study is obtained from secondary and primary sources. This study identifies curriculum and pedagogical innovation, ecosystem and partnership innovation, governance and regulatory innovation, and digital teaching as strategic means of fostering innovation in higher education institutions in Africa. The findings revealed that African graduates are currently competing with other foreigners. Through adequate engagement of innovation in higher education institutions especially digital teaching; African graduates will perform better than other continents graduates in all aspects. This research concluded that fostering innovation in higher education institution in Africa is not for comfort of the students, easy teaching and learning, and academic luxury, but for enhancing the structural framework and stability of the foundation for Africa's transformation. This paper recommended that government of each country in Africa through their education ministry should implement, enforce, and provided necessary facilities for digital teachings.

Keywords: *Higher Education, Innovation, Socio-economic, Jet Stage, African Transformation, Curriculum Reform, Partnership Innovation, Regulatory Innovation, and DiTeachinggital .*

359. Framework Development and Validation for Evaluating Digital Competence of College of Education Lecturers in Nigeria

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The rapid digitalization of global education has exposed significant "technological readiness deserts" within Nigeria's teacher education landscape. This study justifies the urgent need for the development and validation of a 21st-century digital skills competence assessment framework specifically for College of Education lecturers. Employing a qualitative exploratory design, the research utilized semi-structured interviews with twelve purposively selected experts in educational technology and assessment. Thematic analysis revealed critical systemic gaps: 85% of institutions lack standardized evaluation mechanisms, and only 18% have access to validated assessment tools. Findings indicate that lecturer digital deficiencies create a "cascading effect," leaving over 70% of pre-service teachers underprepared for modern classrooms. The study identifies four core themes: the urgency of systematic assessment, systemic preparedness gaps, the impact on graduate quality, and infrastructure constraints. To mitigate these challenges, the study recommends that the National Commission for Colleges of Education (NCCE) institutionalize a validated competence framework aligned with international standards like DigCompEdu and UNESCO's ICT-CFT. Furthermore, digital proficiency must be linked to career advancement and supported by state-funded minimum technology standards. A phased three-year implementation strategy is proposed to transform Nigerian Colleges of Education into centers of digital excellence.

360. Global Partnership and Cross-Border Collaboration in the Digital Campus Era: Reimagining Institutional Cooperation in Higher Education

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The rapid digitalization of higher education has transformed how institutions across the world cooperate, exchange knowledge, and deliver learning beyond national borders. This paper examines global partnerships and cross-border collaboration as strategic responses to the demands of a digitally-driven, borderless academic environment. Using a desk-based review of empirical and policy literature published between 2020 and 2026, the paper interrogates the drivers, mechanisms, and outcomes of international academic cooperation, ranging from collaborative online international learning and virtual exchange to institutional consortia and data-sharing platforms. The review shows that digital collaboration expands access, strengthens intercultural competence, and lowers the cost of internationalization, but that these gains are unevenly distributed because of persistent infrastructural, policy, and capacity gaps, particularly across developing regions. The paper argues that meaningful global partnership in the digital era requires more than connectivity; it requires deliberate investment in digital literacy, inclusive platform design, and equitable governance frameworks that allow institutions with differing resource levels to participate as genuine partners rather than passive recipients. The paper concludes with recommendations for policymakers, university management, and development partners on building resilient, equally beneficial digital collaboration ecosystems in higher education.

Keywords: *Global Partnerships, Cross-Border Collaboration, Digital Campus, Higher Education, and Virtual Exchange.*

361. Harnessing Digital Innovation for Community Health: Reimagining Higher Education as a Hub for Digital Public Health Awareness in Africa

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African higher education institutions are traditionally viewed as centres for teaching and research, yet their potentials as catalysts for community health transformation remains largely untapped. Despite advances in digital innovation, a significant gap persists between university-generated health knowledge and community-level public health awareness, particularly in underserved and rural areas. This digital and knowledge divide continues to fuel misinformation, low health literacy, and preventable disease burdens across the continent. This paper reimagines the role of higher education within the conference theme "Bridging the Digital Divide: Reimagining Future-Ready Higher Education Ecosystems in Africa" by positioning universities as hubs for digital public health awareness. The study explores how digital pedagogy, mobile learning platforms, community radio integration, and AI-driven health chatbots developed within universities can be deployed to democratize public health information. Drawing on recent studies, including UNESCO's 2023 report on digital inclusion in Africa, we argue that sustainable community health requires a shift from classroom-bound teaching to community-embedded digital ecosystems. We propose a conceptual framework — the University-Community Digital Health Bridge (UCDHB) — that links curriculum innovation, student-led digital health advocacy, and low-bandwidth technologies to promote inclusion and equity. The paper concludes that future-ready higher education in Africa must intentionally align digital transformation agendas with the Sustainable Development Goals (SDGs) 3 and 4, to achieve lasting public health impact.

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Keywords: *Public Health Awareness, Community Health, Digital Innovation, Inclusion, Africa, University-Community Engagement*

362. Impediments to Quality in Nigerian Higher Education under Digital Democracy: A Religious Teacher Perspective

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This paper, Impediments to Quality in Nigerian Higher Education under Digital Democracy: A Religious Teacher Perspective, is intended to examines why concurrent shifts toward democratic governance and digital integration have failed to translate into systemic improvements within Nigeria's tertiary institutions of learning. The paper would be written under the premise that despite the developmental opportunities typically associated with democratic era and technological advancement in the country, the higher education sector remains severely constrained. The paper is an

attempt to identify impediments to quality higher education in Nigeria such as; systemic corruption, rising insecurity, recurrent industrial strikes, paucity of funds as a result of underfunding leading to severe infrastructural decay and deficits. Consequent of these impediments, the higher education system in Nigeria remains largely analogue, exacerbating a digital divide. To address these barriers, the paper outlines actionable strategies to reform current frameworks and elevate the quality of higher educational standards in the country.

Keywords: *Impediments, Quality, Higher Education, Digital Democracy, Religious Teacher, Perspective. Being an abstract for paper to be presented at the International Conference on Digital Innovation and Higher Education at the University of Kigali from 7th - 11th December, 2026.*

363. Industrial Attachment Programmes and Graduates Employability in Nigeria

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Industrial attachment programmes have become an important component of higher education in Nigeria because they provide students with practical exposure to real work environments before graduation. Despite the increasing number of graduates produced annually by Nigerian tertiary institutions, many employers continue to express concern about the employability skills of graduates, especially in areas such as communication, technical competence, problem-solving, teamwork, and workplace adaptability. This study examines the relationship between industrial attachment programmes and graduates' employability in Nigeria. The study explores how participation in industrial attachment enhances students' practical knowledge, professional experience, and readiness for the labour market. It further investigates the challenges affecting the effectiveness of industrial attachment programmes, including inadequate supervision, poor placement opportunities, insufficient funding, and weak collaboration between institutions and industries. Using a descriptive and analytical approach, the study argues that effective industrial attachment programmes significantly improve graduates' employability by bridging the gap between theoretical learning and practical application. The paper concludes that strengthening partnerships between tertiary institutions and industries, improving monitoring mechanisms, and providing adequate support for students during attachment periods can contribute greatly to producing more employable graduates in Nigeria. The study therefore recommends policy reforms and institutional strategies aimed at enhancing the quality and relevance of industrial attachment programmes for sustainable workforce development.

Keywords: *Industrial attachment, Employability, Graduates, Tertiary institutions, Skills acquisition.*

364. Infrastructure and Institutional Resilience: a Roadmap for Smart Campus Transformation

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Digital transformation is no longer optional; it is an existential imperative for tertiary institutions seeking to remain relevant in a globalized knowledge economy. However, many institutions are hindered by legacy systems, limited digital infrastructure, and a lack of integrated strategic planning. This study aims to propose a comprehensive model for smart campus development, with the objectives of assessing the role of cloud-based infrastructure and designing strategies to foster institutional digital maturity. To achieve these objectives, the study employed a longitudinal mixed-methods research design conducted across three purposively selected tertiary institutions within southwest Nigeria. The quantitative phase involved the use of SPSS to conduct descriptive and inferential statistical analysis on network latency, server uptime, and IT budget efficiency metrics. Simultaneously, the qualitative phase employed a Thematic Analysis approach, supported by NVivo software, to process data derived from semi-structured interviews with 30 key institutional stakeholders, including principal management staff, faculty leaders, and administrative heads. Furthermore, the study applied the Technology Acceptance Model (TAM) as a theoretical lens to interpret organizational readiness and adoption barriers. This triangulation of empirical performance data and stakeholder perspectives enabled a comprehensive evaluation of both technical benchmarks and the complexities of organizational change management. Findings demonstrate that successful transformation requires a synchronized approach aligning technical infrastructure with organizational culture and financial sustainability. The study concludes that smart campuses are built upon the pillars of robust connectivity, seamless system interoperability, and data-driven decision-making. It is recommended that institutions: prioritize the development of unified digital ecosystems to replace siloed legacy systems; foster cross-departmental collaboration to harmonize digital policy; invest in high-capacity, reliable campus-wide connectivity to support ubiquitous learning; utilize smart data analytics for

resource and energy optimization; and adopt sustainable, renewable energy solutions to power digital infrastructure, ensuring long-term institutional resilience.

365. Innovation Imperatives for Effective Service Delivery by Higher Education Institutions in Nigeria: Perspectives and Conceptualisation

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In the contemporary global knowledge economy, higher education institutions (HEIs) are increasingly pressured to reinvent their operational models to remain relevant and competitive. This paper examines the innovation imperatives needed for effective service delivery within Nigerian higher education institutions landscape, exploring diverse theoretical perspectives and conceptual frameworks. Today, HEIs in Nigeria face myriads of challenges such as infrastructural deficits, outdated pedagogies, bureaucratic bottlenecks, and sever underfunding, all of which impede optimal service delivery. Relying on a conceptual research design, this study synthesizes literature on institutional theory, service-dominant logic, and disruptive innovation to map out the dimensions of educational service quality. The paper conceptualizes effective service delivery across three core pillars: pedagogical innovation (digitalized learning and industry-aligned curricula), administrative restructuring (automated workflows and transparent governance), and student-centric support services (holistic mentorship and tech-driven career counseling). The paper concludes that achieving sustained excellence in Nigerian HEIs requires a deliberate shift from traditional, rigid academic architectures to agile, technology-driven ecosystems. At the end, a conceptual framework is proposed for HEIs administrators and policy-makers to strategically integrate digital transformation, foster public-private partnerships, and cultivate an institutional culture of continuous innovation

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366. Innovative Financing Models for Sustainable Higher Education Development in Emerging Economies: A Structured Narrative Review

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Higher education institutions (HEIs) in emerging economies are expected to expand access, improve quality, advance research and innovation, and adopt digital technologies. Yet many operate under severe financial constraints, including insufficient public funding, rising operating costs, limited infrastructure and growing demand for digital services. This paper asks how such institutions can finance the transformation they need in order to become sustainable and future-ready. The paper presents a structured narrative review of six innovative financing mechanisms: public–private partnerships (PPPs), endowments and alumni contributions, research commercialisation, education and development impact bonds, digital funding platforms and crowdfunding, and industry-supported innovation initiatives. It draws on peer-reviewed studies, multilateral and institutional reports and case evidence, with particular attention to sub-Saharan Africa and Nigeria. Evidence for each mechanism is graded as strong, moderate or limited, and the findings are interpreted through resource dependence theory and the Triple Helix model. The review finds that no single mechanism can replace declining public funding. Evidence is moderate for PPPs, research commercialisation and industry collaboration, and limited for endowments, impact bonds and crowdfunding in emerging-economy universities. Nigerian evidence, including the Tertiary Education Trust Fund (TETFund) and build-operate-transfer student housing, shows that new financing channels deliver benefits but are constrained by access bureaucracy, delayed disbursement and weak financial governance. The paper contributes an evidence-graded comparison of the six mechanisms, a framework linking financing mechanisms to governance conditions, and a sequenced set of recommendations that names the responsible actors. It argues that sustainable financing is a portfolio problem that rests on strong financial governance.

Keywords: *Innovative Financing, Higher Education, Nigeria, Sub-Saharan Africa, Public–Private Partnerships, Resource Dependence, Triple Helix, Financial Governance, University–Industry Collaboration*

367. Innovative Research and Collaborative Teaching for Societal and Economic Impact: An Approach to Sustainable Knowledge Production and Development in Colleges of Education

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The growing complexity of global socio-economic challenges has increased the need for stronger research systems, innovative and collaborative networks capable of generating sustainable solutions. This paper examines the role of research, innovation, and collaboration in promoting social-economic impact in our society. Drawing on Quadruple Helix Theory, the study explores how colleges, industries and government interact to facilitate knowledge creation, technology transfer and social-economic development. A mix-method research design is proposed. The study argues that effective collaboration among stakeholders enhances research productivity, accelerates innovation diffusion among others. Findings indicate that collaborative research networks, strategic innovation and inclusive governance structure significantly contribute to societal well-being and economic competitiveness. However, institutional barriers, inadequate funding, weak policy implementation and limited industry-academia continue to constrain impact. The paper concludes that strengthening research capacity, fostering innovative eco-systems and institutionalizing collaborative frameworks are critical for achieving sustainable development goals. Recommendations are provided for governments, higher education institutions, industries to enhance research effectiveness and innovative-driven growth.

Keywords: *Innovative research, Collaborative teaching, Knowledge transfer, societal impact, Economic development*

368. Institutional Digital Infrastructure and Research Productivity among Academic Staff in Tertiary Institutions in North-East, Nigeria

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Research productivity is a critical indicator of academic excellence and institutional effectiveness in higher education. The availability of digital infrastructure, including internet connectivity, digital libraries, research databases, and information communication technologies, plays a significant role in supporting scholarly activities. Despite growing investments in educational technology, many Colleges of Education in Nigeria continue to face infrastructural challenges that may affect research output. This study investigates the influence of institutional digital infrastructure on research productivity among academic staff in Colleges of Education in Nigeria. A cross-sectional survey design will be adopted. The study population consists of academic staff in federal and state Colleges of Education, from which 500 respondents will be selected using multistage sampling techniques. Data will be collected using the Digital Infrastructure Assessment Questionnaire (DIAQ) and Research Productivity Inventory (RPI). Descriptive statistics, Pearson correlation, and multiple regression analyses will be employed to analyze the data. The study is guided by the Resource-Based Theory, which emphasizes the importance of organizational resources in achieving institutional performance. Findings are expected to reveal the extent to which digital infrastructure predicts research productivity among lecturers. The study will provide empirical evidence for policymakers, institutional administrators, and development partners on the need for strategic investment in digital technologies to enhance research capacity, innovation, and knowledge production within Colleges of Education. The findings are expected to support ongoing digital transformation efforts in teacher education institutions across Africa.

369. Institutional Readiness: Bridging the Digital Divide in Higher Education: A Nigerian Perspective

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Digital transformation has become a defining strategic priority for higher education institutions (HEIs) worldwide, yet the capacity of institutions to translate digital ambition into practice varies sharply, producing a persistent digital divide between well-resourced and under-resourced universities. Nigeria, Africa's most populous nation and home to 274 universities spanning federal, state, and private ownership, illustrates this challenge with particular force: a nationally coordinated push toward digital learning management coexists with epileptic electricity supply, broadband penetration that has only recently crossed 50%, chronic underfunding of public universities, and uneven faculty digital literacy. This paper examines institutional readiness as the decisive, often overlooked, precondition for equitable digital transformation in higher education, with Nigeria as the primary focus of analysis situated within broader international and African comparative context. Drawing on the Technology-Organization-Environment (TOE) framework and the Unified Theory of Acceptance and Use of Technology (UTAUT), the paper analyzes three interdependent dimensions of readiness — technological infrastructure, human capacity and digital literacy, and

organizational culture, governance and policy — and shows how deficits in each dimension compound to widen disparities between Nigerian public and private universities, and between Nigeria and better-resourced systems internationally. Evidence from Nigerian institutions (University of Ibadan, University of Uyo, universities in North-Central Nigeria) is read alongside comparative international literature from Kosovo, Pakistan, Saudi Arabia, Australia, and Southeast Asia. The paper concludes with a policy-oriented framework for bridging the divide in the Nigerian context, emphasizing coordinated infrastructure investment addressing both broadband and electricity, sustained faculty development, strengthened TETFund and National Universities Commission (NUC) coordination, and alignment of digital initiatives with coherent institutional strategy. The paper argues that digital transformation in Nigerian higher education cannot be achieved through technology procurement alone; it requires deliberate, sustained investment in institutional readiness as a socio-technical, rather than purely technical, undertaking.

370. Islamic Ethical Framework for Bridging the Digital Divide and Reimagining Inclusive Future-Ready Higher Education Ecosystems in Africa

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The rapid digital transformation of higher education has created unprecedented opportunities for teaching, learning, research, and innovation. However, persistent disparities in access to digital infrastructure, technological resources, digital literacy, and institutional capacity continue to widen the digital divide across African universities, undermining the realization of inclusive and future-ready higher education ecosystems. This paper examines how an Islamic ethical framework can contribute to addressing these challenges by promoting equitable access to digital opportunities and fostering sustainable educational development. Drawing on the Qur'an, the Sunnah, and the higher objectives of Islamic law (Maqāṣid al-Sharīʿah), the study highlights the relevance of ethical principles such as justice (ʿadl), public interest (maṣlaḥah), trust (amānah), excellence (iḥsān), consultation (shūrā), and the pursuit of knowledge (ṭalab al-ʿilm) in guiding digital transformation within higher education. Using a qualitative doctrinal approach supported by a review of contemporary literature, the paper develops an Islamic ethical framework for promoting digital inclusion, responsible technology adoption, ethical artificial intelligence, institutional collaboration, and inclusive policy formulation. It argues that embedding Islamic ethical values into digital governance and educational planning can enhance equitable access to technology, strengthen academic integrity, reduce educational inequalities, and prepare graduates with the competencies required for the twenty-first-century knowledge economy. The paper concludes that integrating Islamic ethical principles into Africa's digital higher education agenda provides a culturally grounded and sustainable pathway for bridging the digital divide and reimagining resilient, innovative, and future-ready universities capable of advancing the continent's educational and socio-economic transformation.

371. Language Technology and Inclusion: A Critical Pragmatic Perspective on the Digital Divide in African Higher Education

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Globally, teaching, learning, and knowledge creation have all been transformed by the quick integration of digital technology into higher education. However, not everyone benefits equally from this shift, especially in Africa, where educational inclusion is still threatened by enduring disparities in access to digital resources. The majority of current research on the digital divide has concentrated on economic and infrastructure hurdles, while language's influence on participation in and access to digital learning settings has received comparatively less attention. This study examines the digital gap in African higher education from a critical pragmatic standpoint, contending that language serves as a mechanism of inclusion and exclusion in digitally mediated learning environments in addition to being a means of communication. The study examines how language decisions in educational regulations, digital platforms, institutional communications, and online learning practices affect students' access to educational opportunities using critical pragmatics as a lens. It draws attention to the predominance of English and other foreign languages in online learning, which might keep students from other linguistic backgrounds out and contribute to inequality. Additionally, the research shows how discursive practices affect learners' experiences and engagement and exposes the hidden assumptions, presuppositions, and power relations ingrained in digital education discourses. The study uses a qualitative and analytical method, drawing on pertinent literature, government policy papers, and academic conversations on language, technology, and educational inclusion in Africa. The findings show that language exclusion is a significant aspect of the digital divide that is frequently overlooked. Therefore, the study advocates for inclusive

language policy, culturally sensitive educational technology, multilingual digital learning settings, and improved digital literacy programs. The study contributes to existing discussions on rethinking future-ready higher education ecosystems for fair access, participation, and inclusion throughout the African continent by highlighting the relationship between language and technology.

Keywords: *Critical Pragmatics, Digital Divide, Higher Education, Language, Technology, Inclusion, Africa.*

372. Mastery of Online Learning Resources and Its Utilisation in Teaching STEM Rducation in Tertiary Institutions in Nigeria

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The advent of e-learning has led to the development of different learning platforms aside the traditional google platforms. This paper examines the readiness of learners and mastery of the online teaching resources by educators in the delivery of Science, Technology, Engineering and Mathematics (STEM) in Nigeria. It examines the readiness of students to digital education and the competence and utilization of the digital learning resources by lecturers. It also identifies the digital/online educational resources being utilized. The research design used is a descriptive survey which involves lecturers and students from selected tertiary institutions in Nigeria. The instrument for data collection is a structured questionnaire which was analysed by simple percentage and illustrated with charts. It was discovered that a large number of lecturers have not fully achieved a complete mastery of online teaching and learning platforms. Students' apathy was also observed due to the lack of appropriate digital devices. Also of note is the inadequate bandwidth for fast internet connectivity, erratic power supply poor governmental funding and lack of motivation, It is therefore deduced that the mastery of online digital resources and its utilization in the teaching and learning process plays a crucial role in improving the quality of STEM education and encourage collaborative teaching and globalized learning. Recommendations made include training, in-training and retraining of lecturers on the use of digital resources, adequate provision of infrastructure and creating, enabling environment for digital teaching to thrive and motivation for lecturers.

373. Micro-Credentials and Skill-Based Digital Learning as Pathways to Future Workforce Preparedness for Adult Learners in Higher Education in Abia State, Nigeria

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The evolving labour market has increased demand for flexible, competency-based learning that equips individuals with relevant workplace skills. Micro-credentials and skill-based digital learning may support lifelong learning and workforce preparedness by enabling adult learners to acquire, practise, and demonstrate specific competencies. However, access to digital learning opportunities and the perceived value of these pathways among adult learners require attention, particularly within the Nigerian higher education context. This study examined adult learners' perceptions of micro-credentials and skill-based learning, including its digital-skills dimension, as pathways to future workforce preparedness in higher education institutions across Abia State, Nigeria. A descriptive survey design was adopted. The study involved 230 adult learners enrolled in Adult and Continuing Education programmes in selected higher education institutions across the state. Respondents were selected through a multistage sampling procedure. Data were collected with a structured questionnaire titled Micro-Credentials and Skill-Based Learning for Workforce Preparedness Questionnaire (MSLWPQ). Three experts validated the instrument, and its overall reliability coefficient was 0.85 using Cronbach's alpha. Data were analysed using mean and standard deviation. Findings showed that respondents perceived micro-credentials and skill-based learning as supportive of employability, practical competence, digital competence, adaptability, and lifelong learning. Inadequate awareness, programme costs, limited institutional support, restricted access to digital devices and reliable internet, and insufficient access to recognised programmes were identified as barriers. The study recommends institutional investment in accessible digital learning, stronger industry partnerships, clear quality-assurance arrangements, and policy support to widen adult learners' access to credible micro-credential and skill-based learning opportunities. The findings reflect respondents' perceptions and should not be interpreted as a direct measurement of employment outcomes.

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Keywords: *Micro-credentials, skill-based digital learning, adult learners, higher education, workforce preparedness*

374. Modeling Digital Inequality as an Educational Risk: An Actuarial Predictive Framework for Future - Ready Higher Education in Africa

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Digital inequality poses a systemic educational risk to African higher education. This paper introduces an actuarial-predictive framework that treats disparities in digital access, infrastructure, and skills as quantifiable risk exposures. Employing survival analysis, generalized linear models, and stochastic loss processes, the framework estimates the probability, severity and evolution of learning disadvantage. It generates risk metrics such as expected educational shortfall and value-at-risk of learning loss, together with forward-looking policy scenarios. Results show that targeted digital investments can be optimized as risk-mitigation strategies, substantially reducing projected inequality. The approach equips planners with a rigorous mathematical tool for resource prioritization and the design of resilient, future-ready higher education ecosystems.

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Keywords: *digital inequality; educational risk; actuarial modelling; higher education; survival analysis*

375. Navigating Teacher Education Through Digital Innovation in Nigeria:Challenges and New Paradigms

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Teacher education is an integral component of Nigeria's national policy on education, playing a pivotal role of providing quality education at all levels. Accordingly, incorporation of emerging digital resources in teacher-training programs is not an issue of parochial choice but a survival imperative. This paper seeks to examine the trend and issues in teacher education in Nigeria requiring a paradigm shift for global best practices. The paper spotlighted funding gaps, digital competency, institutional readiness in penetration and utilization of digital resources and dearth of unified approach among others, as cardinal loopholes in teacher preparation in Nigeria. It is the opinion of this paper that mainstreaming nano-technology in teacher training in Nigeria would remain a nightmare if the attendant pit-falls are not squarely nipped. Thereupon, the paper explored some exotic strategies to address the complex needs of innovative learning tools for Nigeria to compete on the global stage.

Keywords: *Teacher Education, Digital Innovation, New Paradigms*

376. Re-Engineering Distance Teacher Education and Training (Dtet) in Nigeria for Sustainable Development through Innovative Mobile Learning (Iml)

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Distance teacher education and training (DTET) plays a vital role in achieving sustainable development in Nigeria by enhancing teacher's skills and knowledge, improving teacher's quality and effectiveness, and increasing access to quality education. However, DTET in Nigeria face significant challenges including outdated curriculum, inadequate infrastructure, limited access to resources, and poor teacher engagement. To address these challenges, this study proposes a re-engineered distance teacher education and training model that leverages innovative mobile learning solutions. By leveraging on innovative mobile learning (IML), Nigeria can re-engineer DTET, enhance teacher quality and contribute to sustainable development. Innovative mobile learning leverages mobile technology to create engaging, accessible and personalized learning experiences. It combines mobile devices, advanced pedagogies, digital content and collaborative tools. Using a mixed-methods approach, this research investigates the current state of distance teacher education and training in Nigeria, identifies the challenges and opportunities for innovative mobile learning, and develops a framework for re-engineering distance education and training through mobile learning. The finding of this study highlight the potential of innovative mobile learning to enhance teacher engagement, improve teacher quality and student outcomes, and promote sustainable development in Nigeria. The proposed re-engineered model provides a roadmap for policymakers, educators and stakeholders to transform distance teacher education and training in Nigeria and achieve sustainable development goals. Keywords: Distance teacher education and training (DTET), Innovative mobile learning (IML), Sustainable development, Nigeria, Engineering

377. Reimagining Computer Education For A Future-Ready Digital Society: Innovations, Inclusion, And Sustainable Development

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The rapid advancement of digital technologies has transformed education, the workplace, and society, creating an urgent need to redefine Computer Education. Traditional approaches focused on basic computer literacy are inadequate for preparing learners to thrive in a digital era driven by artificial intelligence, cloud computing, cybersecurity, robotics, big data, and the Internet of Things. This paper examines how Computer Education can be redesigned to develop digital competencies, critical thinking, creativity, and problem-solving skills essential for future-ready graduates. It explores innovative teaching approaches, including artificial intelligence, virtual and augmented reality, project-based learning, blended learning, and open educational resources, to improve learning outcomes. The paper also emphasizes inclusive Computer Education by addressing barriers related to gender, disability, socioeconomic status, geographic location, and the digital divide to ensure equitable access to quality digital learning. Furthermore, it highlights the role of Computer Education in promoting lifelong learning, digital citizenship, ethical technology use, and workforce readiness in alignment with the United Nations Sustainable Development Goals, particularly SDGs 4 and 9. The paper concludes that innovation, inclusion, supportive policies, and strategic partnerships are essential for building a sustainable Computer Education system that equips learners with the competencies needed to drive economic growth, social inclusion, and sustainable national development.

378. Reimagining Knowledge for Innovation, Digital Transformation and Emerging Technologies in Higher Institutions in Nigeria

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The rapid evolution of technology has transformed the landscape of higher education globally, requiring institutions to reimagine knowledge to foster innovation, digital transformation, and the adoption of emerging technologies. This paper examines how Nigerian higher institutions can leverage knowledge management and technological integration to enhance teaching, learning, and research outcomes. Drawing on the Knowledge-Based View (KBV) and Diffusion of Innovations (DOI) theories, the paper explores the role of digital tools, artificial intelligence, virtual learning platforms, and data analytics in promoting personalized learning, collaborative research, and institutional efficiency. The paper further identifies the challenges impeding effective integration, including limited digital infrastructure, inadequate digital literacy, funding constraints, and resistance to change. Empirical evidence from Nigerian and international studies demonstrates that institutions embracing knowledge reimagined through technology achieve improved academic performance, research productivity, and innovation capacity. The paper underscores the need for strategic investment in digital infrastructure, capacity building, supportive policies, and leadership commitment to cultivate a culture of innovation. By effectively harnessing emerging technologies, Nigerian universities can enhance accessibility, foster creativity, and produce graduates equipped with competencies aligned with global digital trends. This paper contributes to the understanding of knowledge reimagination as a catalyst for educational excellence and sustainable institutional development in the digital era.

Keywords: *Digital, emerging, reimagining, innovation, transformation*

379. Reimagining Pre-Service Teacher Training in Colleges of Education: Exploring the Role of Artificial Intelligence Tools in Achieving Education 5.0

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Rapid advancement of Artificial Intelligence (AI) is reshaping educational practices and creating new ways for teacher preparation. As Education 5.0 emphasizes innovation, digital transformation, entrepreneurship, problem-solving, and societal relevance, Colleges of Education are expected to train pre-service teachers with competencies that align with these emerging demands. This study explored the role of AI tools in reimagining pre-service teacher training for the achievement of Education 5.0 objectives.

This study employs a qualitative survey design. The population will comprise pre-service teachers in selected Colleges of Education, while a structured questionnaire will be used to collect data on the availability, utilization, perceived

benefits, and challenges of AI tools in teacher preparation programmes. Data will be analyzed using descriptive statistics. Expected outcomes include empirical insights into the feasibility of AI adoption in this resource-constrained environment, providing evidence-based recommendations for policy, curriculum development and future research aimed at modernizing pedagogical practice and improving education quality in Nigeria.

Keywords: *Artificial Intelligence, Education 5.0, Pre-Service Teacher Training, Colleges of Education, Teacher Education.*

380. Reimagining Sports Science Education in Africa: The Impact of Low-Cost Mobile Tech and Open-Source Platforms on Practical Skills Acquisition During and Post-COVID

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Content: The COVID-19 pandemic exposed severe digital infrastructure gaps in African tertiary institutions, particularly in practical-based disciplines like Exercise and Sports Science. With limited access to biomechanics labs, force plates, and GPS tracking systems, many universities turned to low-cost mobile technologies and open-source platforms to sustain teaching and skills training. This study adopts a development studies lens to evaluate how these digital innovations influenced practical skills acquisition among sports science students in resource-constrained African universities, and their implications for building future-ready higher education ecosystems. Using a mixed-methods design, the research examines the extent of access to mobile apps for exercise prescription, video analysis tools, virtual anatomy labs, and open-source LMS platforms in select North-Central Nigerian universities and compares findings with 2 East African institutions. Data will be collected through questionnaires, practical assessments, and interviews with lecturers and students. The study argues that while high-end digital sports tech remains unequally distributed, strategic adoption of low-cost mobile tech and open-source solutions can bridge the digital divide, improve student competency, and align graduate output with 21st-century sports industry demands. The paper concludes with policy recommendations for inclusive digital infrastructure investment and curriculum redesign to ensure African sports science graduates are globally competitive.

381. Reimagining STEM Higher Education in Nigeria: Smart Digital Transformation for Educators

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Reimagining STEM higher education in Nigeria through smart digital transformation for educators was the focus of this study, carried out in three federal tertiary institutions in Anambra State, Nigeria. Using a descriptive survey design, the research population comprised 300 STEM educators in the selected institutions, from which 100 participants were purposively sampled. Data were collected with the Smart Digital Transformation for Educators Questionnaire (SDTEQ) - an instrument developed for this study to measure digital advancement, smart education integration, and educator readiness - and analyzed using SPSS. Findings indicate that smart digital transformation significantly enhances STEM higher education by improving access to educational resources, fostering interactive and learner-centred environments, increasing instructional effectiveness, and strengthening learners' critical thinking and problem-solving skills. Major barriers to effective implementation included inadequate technological infrastructure, poor internet connectivity, limited funding, and insufficient continuous professional development for educators. The study concludes that purposeful integration of smart educational technologies is essential to elevate STEM higher education and prepare graduates for the twenty-first-century digital economy. It recommends sustained investment in digital infrastructure and structured, ongoing professional development for educators by government and relevant stakeholders.

Keywords: *Reimagining; STEM higher education; Nigeria; Smart digital transformation; Educators; Smart educational technologies; Digital infrastructure; Professional development.*

382. Reimagining the Future of Mathematics Education in Nigerian Higher Education Through Digital Transformation

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Digital transformation is reshaping higher education globally and creating new opportunities for enhancing teaching and learning. In Nigeria, mathematics education remains fundamental to scientific advancement, technological innovation, and national development. However, challenges such as inadequate infrastructure, limited technology integration, poor student performance, and traditional teaching methods continue to hinder effective mathematics instruction in higher education institutions. This paper examines how digital transformation can reimagine the future of mathematics education in Nigerian higher education. It explores the role of emerging technologies, including artificial intelligence, learning management systems, mobile learning, and mathematical software, in improving teaching effectiveness and student learning outcomes. The paper highlights opportunities such as increased access to quality education, personalized learning, enhanced student engagement, and the development of digital competencies. It concludes that sustained investment in digital infrastructure, curriculum innovation, educator training, and supportive policies is essential for transforming mathematics education and preparing graduates for the demands of the digital economy.

Keywords: *Mathematics Education, Digital Transformation, Higher Education, Educational Technology, Nigeria.*

383. Reversing the 'Scraping of History': How Digital Innovation Can Make History Relevant and Popular Again in Nigeria Secondary Schools and University

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The controversial removal and subsequent decline of History as a core subject in Nigerian secondary schools created a significant gap in the nation's educational and cultural development. The neglect of History weakened students' understanding of Nigeria's past, national identity, civic values, and socio-political evolution. Although History has been reintroduced into the school curriculum, challenges relating to student interest, teaching methods, and resource availability continue to hinder its effectiveness. Using a mixed method approach, and adopting the use of the Constructivist Learning Theory, this paper examines how digital innovation can reverse the effects of the "scrapping of History" and make the discipline relevant, engaging, and popular again in Nigerian secondary schools and universities. The study explores the transformative potential of digital technologies such as virtual reality (VR), augmented reality (AR), digital archives, interactive learning platforms, educational mobile applications, podcasts, documentaries, artificial intelligence (AI), and social media in the teaching and learning of History. It argues that integrating these technologies into History education can enhance student engagement, improve access to historical resources, promote critical thinking, and facilitate experiential learning. The paper further highlights successful global examples of technology-driven History education and assesses their applicability within the Nigerian context. It reveals' that digital innovation can bridge the gap between traditional historical narratives and the digital generation. The study further establishes that by embracing digital tools, History can be repositioned as a dynamic and relevant discipline that fosters national consciousness, cultural preservation, and informed citizenship among Nigerian students in the twenty-first century. It concludes that strategic investments in educational technology, teacher training, curriculum modernization, and digital infrastructure are essential for revitalizing History education in Nigeria.

Keywords: *History, Students, Innovation, Technology, AI*

384. Role of Digital Innovations in North -Eastern Nigerian Higher Institutions

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The study examined the role of digital innovations in North-Eastern Nigerian higher institutions. It specifically described the benefits derived from the utilization of digital innovations and identify the challenges hinder the effective utilization of digital innovations in the higher institutions. Multistage sampling technique was adopted to sample the 209 respondents and the data obtained were analyzed using descriptive statistics and Garette Ranking Analysis. The result revealed that the major benefits derived from digital innovation utilization in higher institutions include improved access to learning resources (91.4%), enhanced teaching and learning effectiveness (88.0%), improved communication between lecturers and students (85.2%) and easy access to digital libraries and academic databases (83.3%). The findings further show that digital innovations have promoted flexible learning opportunities, improved research productivity, enhanced collaboration, and increased digital literacy among users. The Garrett ranking results reveal that inadequate internet connectivity is the most critical challenge affecting the utilization of digital innovations in North-Eastern Nigerian higher institutions, with a Garrett Mean Score of 72.41. It was followed by unreliable electricity supply (69.83), inadequate funding for digital infrastructure (66.72), and limited ICT training

opportunities (63.95). The least severe challenge identified by respondents was cybersecurity concerns, although it remains an important issue requiring attention. The study recommends that government and educational stakeholders should invest in reliable broadband internet infrastructure to improve connectivity across higher institutions, higher institutions should adopt alternative energy sources such as solar power systems to mitigate the effects of unreliable electricity supply, increased budgetary allocation should be provided for the acquisition, maintenance, and upgrading of digital infrastructure and institutional management should strengthen technical support units to ensure efficient operation and maintenance of digital facilities and partnerships should be established between higher institutions, government agencies, and technology companies to support digital transformation initiatives.

Keywords: *Role, Digital, innovations, North-Eastern, Nigerian and higher institutions*

385. Scaffolding Equity: a Curriculum Studies Approach to Bridging the Digital Devide for Future-Ready Higer Education in Nigeria

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Based on Curriculum Studies and Vygotsky's Zone of Proximal Development, this study reimagines the university curriculum not as a static content repository but as a scaffold, equity-centered architecture responsive to contextual heterogeneity. Using a Design-Based Research approach, the study will map current digital gaps across six Nigerian universities, then co-design and pilota "Tiered Blended Curriculum Model" that complies with NUC benchmark standards for competency-based assessment, peer-mediated scaffolding, and low-bandwidth core content. Impact on digital self-efficacy, engagement, and learning outcomes will be assessed using data from surveys, interviews, learning analytics, and pre/post tests; policy implications will be validated through a Delphi approach. Findings aim to shift institutional and NUC benchmarks from measuring digital “access” to ensuring digital “equity,” offering a context-fit framework for building resilient, inclusive, future-ready higher education in Nigeria.

Keywords: *Digital divide, curriculum studies, future-ready education, blended learning, Nigeria*

386. Smart Campus Development and the Future of Social Studies Education in Colleges of Education

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The rapid advancement of digital technologies has transformed the educational landscape worldwide, necessitating the development of smart campuses that support innovative teaching, learning, and institutional management. In Colleges of Education, smart campus development integrates digital infrastructure, internet connectivity, smart classrooms, learning management systems, digital libraries, and other technology-driven resources to create an enabling environment for academic excellence. This transformation is particularly significant for Social Studies Education, which aims to equip learners with the knowledge, skills, values, and competencies required for effective citizenship and participation in a rapidly changing society. This paper examines the role of smart campus development in shaping the future of Social Studies Education in Colleges of Education. It explores how digital infrastructure and smart learning environments enhance instructional delivery, collaborative learning, access to educational resources, critical thinking, civic engagement, and digital citizenship among students. The paper also discusses the potential of smart campus technologies to promote interactive and learner-centered pedagogies that align with the demands of twenty-first-century education. Furthermore, it highlights the challenges confronting the implementation of smart campus initiatives in Colleges of Education, including inadequate funding, limited technological infrastructure, poor internet connectivity, insufficient digital skills among educators, and unstable power supply. Drawing on contemporary literature and emerging practices in educational technology, the paper advocates for strategic investments in digital infrastructure, capacity building for educators, policy support, and sustainable technology integration. It concludes that smart campus development is essential for transforming Social Studies Education and preparing future teachers to address the social, economic, political, and technological realities of modern African societies. The study recommends a collaborative approach involving government agencies, educational institutions, private sector partners, and development organizations to bridge the digital divide and foster future-ready higher education ecosystems.

Keywords: *Smart Campus, Social Studies Education, Digital Infrastructure, Educational Technology, Digital Citizenship, Colleges of Education, Higher Education, Africa.*

387. Strengthening Research, Innovation and Collaboration for Societal and Economic Impact

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Research is a process of finding out the solution to a problem. The motivating force in all research is the existence of a problem and the urge to take care of or solve it. Without this problem situation, there will be no research. It is the existence of a problem that propels a researcher to invent new ideas which will be a modification to the existing one that leads to innovation which figuratively denotes "Invention and Vocation". Ecosystem is a network of interdependence actors, institutions which use knowledge for innovation and societal value. Research, innovation and collaboration do not take place in a vacuum and cannot be treated in isolation. When the Research, knowledge, innovation and Ecosystem align, they help people to turn occupation into vocation by connecting work to societal impact. This study, therefore, highlights how a strong ecosystem improves research, innovation, and knowledge, which in turn grows an economy that impacts positively on society.

Keywords: *Ecosystem, innovation knowledge, research*

388. Teaching French (FLE) Online with Limited Connectivity: Frugal Strategies for West African Higher Education

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This study examines frugal digital strategies for effective teaching of French language online on resourced constrained West African tertiary institutions. Online teaching of French FLE in West African tertiary is constrained or limited by connectivity, unreliable power as well as high data costs. The shift to online teaching and learning during and after COVID – 19 has led to deep digital inequalities in West Africa, especially for the teaching and learning of French language. The teaching of French FLR online relies on bandwidth-intensive tools such as zoom and video streaming which is inaccessible to many lecturers and students due to high cost of data, frequent power failure which has led to unreliable power supply as well poor network. Despite the increased usage of digital learning, some studies such as mobile-first pedagogical models for French FLE in low-connectivity contexts still facilitate online teaching. This gap limits the West African tertiary institutions to deliver effective online teaching and learning of French. This study therefore explores frugal digital strategies for the effective teaching of French online. This study concludes that digital divide in French FLR is a design problem, not just a technology problem. West African institutions can build future-ready ecosystems by embracing frugal mobile-first pedagogy that works in limited or low connectivity. The study therefore recommends among others that institutions should mandate offline accessible course design.

Keywords: *FLE, online teaching, limited connectivity, frugal strategies, West Africa.*

389. The Effect Of Inequalities In Access To Digital Infrastructure On The Learning Outcomes Of Tertiary Institution Students In Abeokuta, Nigeria And The Counselling Implications

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The rapid expansion of online learning, especially after the COVID-19 pandemic, has exposed the inequalities and highlighted the urgent need for strategies that promote digital inclusion; despite improvements in technological infrastructure, significant disparities persist in access to devices and internet services, especially among disadvantaged learners. Therefore, bridging the digital divide is therefore essential for efficient learning outcomes, quality teaching and learning as well as overall educational development. This study was carried out to investigate the effect of inequalities in access to digital infrastructure on the learning outcome of tertiary institution students in Abeokuta, Nigeria and the Counselling implications. The study Participants were one hundred and ten (110) respondents consisting of thirty four females and seventy six males selected through stratified random sampling technique from four tertiary institutions within Abeokuta metropolis in South-Western Nigeria. Two hypotheses were postulated and tested using student t-test at 0.05 level of significance. Findings showed significant difference in learning outcome of undergraduates based on their access to technological infrastructure while there was no significant main effect of gender on learning outcomes of in male and female undergraduates. Consequently, it was recommended among others that, tertiary institutions should collaborate with governments, telecommunications companies, and development

agencies to improve internet connectivity and provide affordable access to digital devices. Also, Investments in campus-wide broadband services, digital laboratories, and subsidized internet packages should be given a significant attention to reduce access-related inequalities so as to improve academic engagement and learning outcomes. Also, the findings portend some implications for counselling which were essentially discussed.

390. The Impact of Digital Tools on Guidance and Counselling Services in Nigerian Schools: Benefits and Challenges

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This study presents an extensive review that examines how digital tools are reshaping Guidance and Counselling services in Nigerian higher institutions. It investigates the opportunities that online counselling platforms provide and the substantial institutional, infrastructural, and attitudinal obstacles that continue to slow their broader adoption. Using a thematic synthesis of scholarly literature and key policy documents, guided by the Technology Acceptance Model (TAM), the study maps the current landscape of digital guidance and counselling services across Nigeria. Findings reveal that digitalization brings considerable benefits, among them greater student privacy, improved access, convenience, and demonstrated effectiveness in addressing mental health concerns such as academic burnout. However, inadequate internet connectivity in rural areas, high data costs, and a lack of the basic digital skills needed for counsellors and clients to engage meaningfully with such platforms are among the greatest obstacles affecting the digitalization of guidance and counselling services. On the institutional side, insufficient training for counsellors has led to low technological proficiency and heightened professional uncertainty among practitioners. The study concludes that, while digital tools hold genuine promise as a means of addressing long-standing deficiencies in guidance and counselling service provision in Nigeria, unlocking that promise will require urgent, well-coordinated efforts across infrastructure development, curricular reform, and the inclusion of e-counselling training in professional preparation programmes.

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Keywords: *Digital Tools, Guidance and Counselling, Nigeria, E-Counselling, Technology Acceptance Model (TAM), Benefits and Challenge*

391. The Impact of Information and Communication Technology (ICT) on Human Resource Management

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Information and Communication Technology (ICT) has basically reformed Human Resource Management (HRM), evolving it into a digital, data-driven, and strategic function through concepts such as e-HRM, digital HRM, and HR digital transformation. Current learnt work from 2023-2026 highlights how ICT tools, as well as artificial intelligence (AI), cloud-based HR information systems (HRIS), big data analytics, mobile platforms, and automation, enhance key HR processes like recruitment, training, performance management, employee engagement, and strategic decision-making. These improvements deliver considerable benefits, including operational efficiency, cost reductions, improved employee experience, innovation support, and organizational agility. However, challenges persist, such as data privacy and cybersecurity risks, algorithmic bias, implementation complexities, digital skill gaps, resistance to change, and concerns over dehumanization of HR interactions. This paper creates evidence from contemporary peer-reviewed studies to provide an in-depth examination of these impacts, benefits, challenges, and future implications for HRM in the digital era.

392. The Role of Digital Technologies in Promoting Sustainable Practices in Higher Education

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The increasing demand for sustainability in higher education necessitates the adoption of innovative and scalable approaches, particularly within the African context. This paper contends that digital technologies provide a viable framework for promoting sustainable practices across teaching, learning, and institutional operations. It examines the

potential of tools such as cloud computing, virtual learning environments, learning analytics, and smart campus systems to enhance resource efficiency, reduce environmental impact, and support flexible learning modalities. Particular attention is given to digital assessment and feedback systems, which facilitate timely, data-driven evaluation while minimizing dependence on physical materials. Beyond their pedagogical benefits, such systems contribute to sustainability by reducing paper consumption and supporting continuous academic improvement. Drawing on existing literature and emerging global practices, the paper advances a conceptual framework for aligning digital transformation with sustainability objectives in higher education. The paper also highlights key challenges, including infrastructural limitations, digital inequality, and inadequate policy frameworks, which may impede effective implementation in African institutions. It argues that the successful integration of digital technologies for sustainability requires deliberate policy direction, institutional commitment, and inclusive access strategies. The paper concludes that digital innovation, when strategically implemented, can serve as a critical enabler of sustainable higher education systems

393. The Role of Digital Technology and Entrepreneur Pedagogy for a Secured Future

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The recent revolution in higher education institutions is revamping pedagogy and student's self-development for a secured future. This paper examines the role of digital technology and entrepreneurial education to enhance academic performance and standard of living. The study was conducted using a mixed-methods approach which involved reviewing relevant literature and research questionnaire to elicit information from participants. Data was randomly collected from population of 500 lecturers and 2000 students in higher education institutions in Nigeria. Data was analyzed using descriptive statistics. The result showed that digital devices and internet enhanced pedagogy. Also, findings reveal the extent to which entrepreneurship-oriented curriculum and knowledge of digital technology equips the learner with practical skills, creative and innovative mindset for sustainable self-development within and beyond academic institutions, improving national economy. It recommends that lecturers and students should be trained and provided with necessary technological gadgets. Entrepreneurship development centers should be provided in higher education institutions.

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Keywords: *Higher education institutions, pedagogy, digital technology, entrepreneurial education, self-development, secured future.*

394. Towards Resilient and Future-Ready Higher Education Ecosystems in Africa: a Framework for Digital Inclusion and Innovation

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Fast developments in digital technology, together with globalization, disruption by technology, pandemics and other public health emergencies, labour market changes, have brought changes in higher education worldwide. However, there still persist many difficulties faced by higher education institutions in Africa, namely inadequate digital infrastructures, finance, policy implementation, digital capabilities and socio-economic differences. All these factors contributed to increased digital divide and restricted ability of universities to innovate and sustain sustainable development in a changing environment. The paper examines the need to build resilient and forward-looking higher education systems in Africa from a digital perspective using Digital Transformation Theory, Educational Resilience Theory and Innovation Ecosystem Theory. Qualitative, doctrinal and analytical method is used relying on scholarly articles, policy documents, institutional reports and international best practices. Current state of digital transformation in African higher education system is assessed and principal structural, institutional, technological and governance barriers to creation of flexible and inclusive learning environments identified. It is concluded that resilience does not only mean technological adaptation, but also implies institutional flexibility, digital literacy, inclusive governance, sustainable financing and cooperation between governments, private sector and academia. Framework to increase resilience through targeted investments in digital infrastructures, capacity building, research cooperation, policy coordination and emerging technologies such as artificial intelligence and big data analysis is proposed. The conclusion drawn from analysis is that resilient and forward-looking higher education systems are necessary for improving the quality of education, expanding access to it, social inclusion and strengthening competitiveness of Africa in global knowledge economy.

395. Transforming African Higher Education through Artificial Intelligence and Digital Technology Devices

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The rapid evolution of Artificial Intelligence (A.I) and digital technology devices is a means to a profound paradigm shift in African higher education. Historically, there are constraint by infrastructural deficit, poor funding and poor access to equal higher education across the country. The paper examines the transformative impact of integrating A.I tools such as adaptive learning platforms, predictive analytics for student retention and automated administrative system alongside digital devices such as smart phones, tablet and laptops. With current implementation trends, this study highlights how technology democratic access to quality education, foster personalized learning experiences and prepares Nigerian graduates for a globalized technology driven works. It will also address critical challenges impending this digital transformation, notably the digital divide erratic power supply, high data cost and a lack of specialized institutional frameworks. The findings indicates that while the localized A.I and mobile digital devices offer unprecedented opportunities to sale educational equity and excellence, the success depends on deliberate stakeholders collaboration. It was concluded that strategic framework for policy makers, educators and technology developers aimed at building resilient digital ecosystem. Ultimately, the transformation of higher of higher education through A.I and digital is not merely a technological upgrade but a socio-economic imperative essential for driving the higher education to a sustainable and capitalizing state.

Keywords: *Artificial Intelligence, AI Tools, Digital technology, Education, Transformation, Higher Education*

396. Transforming English Language Teaching and Research in the Wake of Digital Innovations

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The prevalence of digital technologies has fundamentally transformed the landscape of English Language Teaching (ELT) and research, creating new opportunities for innovation, accessibility, and learner-centered pedagogy. Adavancements in artificial intelligence (AI), learning management systems, virtual classrooms, mobile learning applications and data analytics are redefining how English is taught, learned, assessed, and investigated across diverse educational spheres. It is in this regard that his paper examines the critical implications of these digital innovations for contemporary ELT and language research. It is indeed with particular attention to developing countries where technological advancement presents both significant opportunities and persistent challenges. This study adopts a conceptual and analytical approach in synthesizing current literature. It is with a view to exploring the integration of AI-powered instructional tools, adaptive learning platforms, computer-assisted language learning (CALL), corpus linguistics. The objective is to enhance language proficiency, learner engagement, teacher effectiveness, and research productivity. The paper further interrogates emerging concerns relating to digital inequality, ethical use of artificial intelligence, academic integrity, teacher digital competence, cybersecurity, and the preservation of critical thinking in technology-mediated learning environments. It argues that meaningful transformation in ELT extends beyond the mere adoption of digital tools to the strategic redesign of pedagogical practices, curriculum development, assessment frameworks, and research methodologies that promote inclusivity, creativity, collaboration, and lifelong learning. The paper concludes that sustainable digital transformation requires continuous professional development, robust institutional support, equitable access to technological resources, and policy frameworks that balance innovation with ethical responsibility. By providing an integrated perspective on the intersection of digital technologies, English language education, and scholarly inquiry, the study contributes to ongoing global conversations on the future of language education in an increasingly digital society.

397. Use of AI to Enhance Digital World Economy through Nigeria Teacher Education System

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The focus of this study is to investigate the pivotal role of AI in boosting the digital economy in Nigeria, through teacher education. With the increasing adoption and integration of Technological tools for economic gains, there is no gainsaying the fact that global economy has become increasingly digitized. There is need therefore to prepare and equip educators and relevant stakeholders in the sector, with requisite skills and AI tools necessary to drive Nigeria's digital economy for sustainable development. The study highlights the need for education policy makers to be intentional about integrating AI in Nigeria teacher education system in order to imbue in the learners, digital technical know-how required to contribute their quota to the economy of Nigeria. The research recommends provision of digital infrastructure, capacity building training and curriculum reforms as ways of overcoming possible challenges.

Inclusion, Equity and Digital Access

46 abstracts

Closing the digital divide for rural, disadvantaged and disabled learners and under-resourced institutions.

398. A customized design system for Nigerian language collections in Libraries

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Nigeria is home to over five hundred (500) indigenous languages, yet most libraries across the country lack adequate systems for organising, preserving, and providing access to these linguistic resources. Existing cataloguing and classification standards such as Library of Congress Classification (LCC), the Dewey Decimal Classification (DDC) and Universal Decimal Classification (UDC) do not sufficiently accommodate the structural and cultural complexities of Nigerian languages. As a result, indigenous language collections remain marginal, poorly indexed, and inaccessible to users. This research proposes the development of a customized design system for Nigerian language collections in libraries. Using a mixed-methods approach, the study will investigate current practices, identify gaps, and design a culturally responsive classification and management framework. The findings are expected to support improved documentation, preservation, and accessibility of Nigerian languages, strengthening national identity and contributing to long-term cultural sustainability.

Keywords: *Customized Design, Nigerian Language Collections and Digital Libraries.*

399. Access to Digital Learning Resources and Academic Performance among History Students of the Federal College of Education, Jama'are, Bauchi State, Nigeria

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Computers, smartphones, internet tools, and online libraries are changing the way students learn all over Africa. Today, studying History is no longer just about reading old paper books or listening to classroom lectures. Modern History students need to look at old historical records online, read electronic books (e-books), search through digital museum collections, and read international research articles on the web to fully understand the past. However, not every student has the same chance to use these digital tools. This study wants to find out if having easy access to these internet learning tools helps History students at the Federal College of Education (FCE), Jama'are, get better grades in school.

400. Banditry and Socio-Economic Challenges Faced by Internally Displaced Women in Northwest Nigeria: a Case of Katsina State (2015 - 2025)

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Banditry in the North-western states of Katsina, Kaduna, Kebbi, Sokoto and Zamfara have led to the loss of lives and property and the displacement of millions and thousands of people especially women and children with adverse socio-economic challenges of inadequate shelter, food insecurity, lack of access to justice in the case of violation of their rights, poor sanitation and hygiene, sexual violence and exploitation, human trafficking, and lack of access to necessities. Despite the existing policies and principles on the rights of the IDPs, government and non-governmental humanitarian organisations that are supposed to assist and protect the rights of the IDPs, the situation of the IDPs is becoming more heartbreaking. This is due to a lack of commitment by the government and the preponderance of corruption in the management of relief items meant for the IDPs. It is against this backdrop that this paper examines the complex and devastating interplay between banditry, internal displacement and socio-economic challenges faced by IDP women in Northwest Nigeria: A Case Study of Katsina State, 2015-2025. The paper employs qualitative research methods in data collection and analysis. Through the use of key informant interviews, focus group discussions, and primary and secondary data as the instruments and sources of data collection, respectively. Theoretically, the paper adopts the Human Need Theory as a guide in the analysis of issues under investigation. Findings from this study revealed that the socio-economic well-being of IDP women in the state is not guaranteed. The IDPs faced life-threatening challenges of exchange of 'food and shelter for sex', forced prostitution, the threat of diseases, hunger and starvation, the threat of forced and early marriage, human trafficking and child labour. The study

found that efforts made by the government and non-governmental humanitarian organisations are not sufficient to address the socio-economic conditions of the IDP women in the State. Based on these findings the study recommends that the socio-economic conditions of IDP women can only be safeguarded when the government is committed to providing the peculiar needs of the IDPs such as medical aid, clean water, food and other essential household items; strict adherence to principles and policies on the rights of IDPs women and children; access to justice in the cases of violation of IDP's right; zero tolerance for corruption; and the provision of formal IDPs with proper management.

401. Beyond Connectivity: a Conceptual Framework for Inclusive, Equity, and Digital Access in African Higher Education

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In the recent times, digital technology is seen as an ever-increasing factor in all facets of life. In education, technology is a force that should be reckoned with. It creates an active learning environment that allows learners to develop a passion for learning. Digital access is one of an issue that divides the world. There are many differences in access to quality digital technology. The paper examines the correlation between inclusion, equity and digital access in higher education with regard to the digital divide as one of the issue that divides the world. In developed countries, universities can acquire digital technologies, while in under developed countries, the opposite is the case. The paper reviews recent literature to examine the dimensions and impediments of digital inclusion in higher education in Africa. The argument is that digital access has gone beyond physical connectivity to include affordability of relevant devices, digital know-how, accessibility for students with disabilities, reliable infrastructure and meaningful participation in learning. In conclusion, the paper recommends a digital access perspective that puts together infrastructure, affordability, digital literacy, accessibility. Institutional support as an essential condition for achieving equitable participation in African higher education.

Keywords: *Inclusion, Equity, Access, Digital Technology, Digital Divide.*

402. Beyond Devices: Addressing Digital Pedagogy, Teacher Training, and Learning Environments for Equitable Physics Education in Nigeria

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The provision of digital devices in Nigerian classrooms has not translated into meaningful learning gains in physics, largely because policy and institutional focus remain only on hardware provision rather than the human and pedagogical infrastructures required for their effective usage. This paper argues that equitable physics education in Nigeria cannot be achieved through device distribution alone but demands a simultaneous transformation of digital pedagogy, teacher training, and learning environments. The author examines the persistent digital divide not merely as a matter of access, but as a function of unprepared teachers, culturally irrelevant content, and physical learning spaces not well suited for inquiry-based teaching and learning. The paper draws on the technological pedagogical content knowledge (TPACK) framework and on lessons from low-resource contexts similar to Nigeria, including successful interventions in Ghana and rural India. It identifies three critical gaps. First, teacher education programmes that treat digital tools as mere add-ons rather than as essential scaffolds for learning, resulting in graduates who can operate devices but cannot design inquiry-driven physics lessons. Second, professional development that focuses on device manipulation rather than on designing effective instruction, for example, training teachers to boot a computer but not to diagnose student misconceptions using a simulation. The consequence is that even where devices are present, they are deployed for rote tasks like displaying notes or playing videos, never for interactive conceptual engagement. Third, laboratory environments that lack reliable power, internet connectivity, and basic maintenance protocols, will make functional devices unusable for extended periods. The author contends that without addressing these foundational problems, device proliferation will continue to reproduce, rather than remedy, existing inequities between urban and rural, private and public, and male and female learners. The paper concludes with recommendations for a comprehensive approach that integrates digital teaching suited to local contexts, sustained teacher learning communities, and the redesign of physics laboratories to support collaborative and student-centred learning. Only such a holistic strategy can transform digital devices from status symbols into genuine instruments for equitable access and conceptual mastery in Nigerian physics education.

Keywords: *Digital Pedagogy, Physics Education, Teacher Training, Learning Environments, Educational Equity, Nigeria*

403. Bridging Digital Inequalities in Business Studies Education in Nigeria through Artificial Intelligence and Emerging Technologies for Future-Ready Learning

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The increasing integration of artificial intelligence (AI) and emerging technologies into contemporary educational systems has become a critical driver of pedagogical transformation and skills development in the twenty-first century. However, in Nigeria, persistent disparities in access to digital infrastructure, technological resources, and digital literacy continue to intensify digital inequalities, particularly within Business Studies Education. This paper investigates how AI and emerging technologies can be leveraged to address these inequalities and promote future-ready learning outcomes in Business Studies Education in Nigeria. The paper adopts a conceptual and analytical approach, drawing evidence from extant literature, educational policies, and global best practices on digital transformation in education. It examines the pedagogical potential of AI-enabled tools such as adaptive learning systems, intelligent tutoring systems, learning analytics, digital simulations, and virtual collaborative platforms in enhancing instructional delivery and learner engagement in Business Studies. The paper identifies major constraints to effective integration, including inadequate ICT infrastructure, unreliable electricity supply, limited internet connectivity, insufficient funding, and low levels of teachers' digital pedagogical competence. It further highlights the implications of unequal access to digital devices and learning resources for learners in rural and urban settings, which continues to widen educational disparities. The study argues that the strategic integration of AI and emerging technologies has the potential to enhance entrepreneurial thinking, improve decision-making skills, strengthen problem-solving abilities, and support inclusive participation in Business Studies classrooms. It concludes that addressing digital inequalities requires sustained investment in digital infrastructure, continuous teacher professional development, curriculum innovation, and robust policy implementation supported by multi-stakeholder collaboration to ensure equitable access to AI-driven educational ecosystems and future-ready learning opportunities in Nigeria.

Keywords: *Business Studies Education, Artificial Intelligence, Technologies, Digital Inequality and Future-ready Learning*

404. Bridging ICT Phobia in Academia: Causes, Implications, and Strategies for Digital Adaptation

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This study investigated the prevalence of ICT phobia among academic and non-academic staff in three selected tertiary institutions and examined its causes, implications, and possible mitigation strategies. A descriptive survey research design was adopted, with data collected through a structured questionnaire administered to randomly selected respondents from the institutions. The findings revealed that although a majority of staff acknowledged the importance of ICT in contemporary academic practice, a substantial proportion exhibited varying degrees of anxiety and reluctance toward the use of digital technologies. The major factors responsible for ICT phobia included inadequate digital literacy, fear of making mistakes, resistance to change, insufficient training opportunities, age-related concerns, and lack of technical support. The study further found that ICT phobia negatively affected staff productivity, efficiency in service delivery, participation in online academic activities, and overall institutional effectiveness. Statistical analysis indicated a significant relationship between exposure to ICT training and willingness to adopt digital technologies. Based on the findings, the study recommends regular capacity-building programmes, continuous professional development in ICT, mentorship schemes, improved technical support services, and institutional policies that encourage digital competence among staff. The study concludes that addressing ICT phobia is essential for enhancing academic performance and ensuring the relevance of tertiary institutions in an increasingly technology-driven environment.

405. Bridging Inclusion Gaps in Higher Education: Humanising Pedagogy for Future-Ready and Student-Centred Learning in Africa

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This paper explores how humanising pedagogy can contribute to the development of inclusive, student-centred and future-ready higher education in Africa. While digital transformation offers opportunities to expand access and enhance learning, technological innovation alone cannot ensure meaningful inclusion. Future-ready higher education

also requires learning environments in which students are recognised, heard and actively involved in shaping their educational experiences.

The study employed Critical Participatory Action Research (CPAR) with 15 second-year Bachelor of Education students enrolled in the PEDS202: Curriculum Policy and Development module at Nelson Mandela University, South Africa. Through Action Learning Sets, students reflected on their curriculum and pedagogical experiences, identified barriers to participation and belonging, and collaboratively explored possibilities for curriculum transformation. This approach positioned students as active contributors to knowledge production rather than passive recipients of predetermined knowledge.

Findings reveal that students experienced aspects of the curriculum as disconnected from their lived realities, identities and community knowledge. Hierarchical classroom relationships, assessment-driven learning and limited opportunities for dialogue contributed to student silence and passive participation. Participatory dialogue, however, enabled students to move from silence to voice and from passive participation to active engagement. Students emphasised contextual relevance, dialogue, recognition of diverse knowledge, inclusive relationships and shared responsibility as conditions for meaningful learning.

Drawing on these findings, the paper proposes the Humanising Curriculum Transformation Model (HCTM), which foregrounds epistemic recognition, dialogue, contextual responsiveness, co-creation, relational accountability, praxis and institutional embedding. The paper argues that future-ready African higher education should place human relationships, student agency and inclusive knowledge-making alongside technological innovation, ensuring that transformation does not simply digitise existing inequalities but creates more equitable and responsive learning ecosystems.

406. Bridging the Digital Divide for Children with Hearing Impairment through Assistive Technologies in Early Childhood Education in Nigeria: Advancing Inclusion, Equity and Access for All

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The growing integration of digital technologies into education has created significant opportunities for enhancing access, participation, and learning outcomes across diverse learner populations. However, children with hearing impairment in Nigeria continue to experience substantial barriers to equitable access to quality Early Childhood Education (ECE), largely due to the digital divide and inadequate availability of appropriate assistive technologies. This paper examines how assistive technologies can be utilized to bridge the digital divide for children with hearing impairment in Early Childhood Education in Nigeria while advancing inclusion, equity, and access for all learners. The paper adopts a conceptual and analytical approach, drawing insights from extant literature, inclusive education policies, and global best practices in special needs education and educational technology integration. It explores the relevance of assistive digital tools such as hearing aids, speech-to-text applications, visual learning systems, sign language-supported digital platforms, and interactive multimedia resources in supporting communication, comprehension, and cognitive development among learners with hearing impairment. The paper identifies key constraints limiting effective implementation, including inadequate funding, insufficient specialized teacher training, limited availability of assistive devices, weak ICT infrastructure, and low awareness of inclusive digital education practices. It further emphasizes the role of digital inclusion in fostering equitable learning environments that support early communication development and foundational literacy skills. The paper argues that strategic integration of assistive technologies within ECE can significantly enhance participation, engagement, and learning outcomes for children with hearing impairment. It concludes that bridging the digital divide requires sustained investment in inclusive educational technologies, teacher capacity building, policy implementation, and multi-stakeholder collaboration to ensure equitable access to quality early childhood education for all learners in Nigeria.

407. Bridging the Digital Divide in African Higher Education: a Study of Inclusion, Equity, and Digital Access in Universities in South-East Nigeria

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This study investigated issues of inclusion, equity, and digital access within higher education institutions in South-East Nigeria, with the broader goal of addressing the digital divide and supporting the development of future-oriented

university systems in Africa. The study was anchored on four specific empirical objectives, which examined students' and lecturers' level of access to digital learning tools, the degree of digital inclusion in academic activities, the challenges limiting effective digital participation, and the influence of institutional support mechanisms on equitable access to digital resources. A descriptive survey research design was employed. The study population consisted of undergraduate students and academic staff from selected universities in South-East Nigeria. A sample of 500 respondents was drawn from six universities using a multi-stage sampling procedure that combined stratified, proportionate, and simple random sampling techniques. Data were gathered through a structured questionnaire, which was validated by experts in Educational Technology and Measurement and Evaluation to ensure suitability and relevance. Reliability was confirmed using Cronbach's Alpha, with a threshold of 0.70 and considered acceptable. Data were analyzed using mean and standard deviation, based on a 2.50 decision benchmark on a 4-point Likert scale. The study observed differences in levels of digital access and inclusion, influenced by infrastructural gaps, affordability issues, and limited digital literacy skills. It concludes that improving ICT infrastructure and strengthening institutional support systems are critical for reducing digital inequality in South-East Nigerian universities.

Co-authors: *Carlyster Nonye Ijere; Loveth Eze*

Keywords: *Digital divide, inclusion, equity, digital access, higher education, South-East Nigeria.*

408. Bridging the Digital Divide in African Higher Education: Promoting Digital Access, Equity, Inclusion, and Sustainable Citizenship for Future-Ready Graduates

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The study determines the effect of digital access, equity, and inclusion on bridging the digital divide and fostering sustainable citizenship competencies among students of higher institutions in South-East Nigeria. This study adopted a mixed methodological approach combining both a structured questionnaire and an interview for data collection. The study employed a multi-stage sampling method to ensure equal opportunity and representation of the respondents and, at the time, achieve validity and generalizability of the findings of the study. The findings of the study indicate that improved digital access, equity, and inclusion contribute to greater participation, fewer learning inequalities, and higher sustainable citizenship competencies among students in higher education institutions. This study provides useful insights and practical recommendations to institution authorities, policymakers, and educators in the formulation of digital policies that eliminate the digital divide and foster sustainable citizenship among graduates in the digital age.

409. Bridging the Digital Divide in Early Childhood Education in Nigeria: Promoting Equity, Inclusion and Access Through Technology Integration

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Abstract

The increasing digitization of educational systems has generated significant opportunities for enhancing teaching and learning outcomes across all levels of education. Nevertheless, disparities in access to digital technologies continue to exacerbate educational inequalities, particularly within Early Childhood Education (ECE) in developing countries such as Nigeria. This paper examines the implications of the digital divide for equity, inclusion, and access in ECE and explores the potential of technology integration as a mechanism for addressing existing educational disparities. The paper adopts a conceptual and policy-oriented approach, drawing on extant literature, national education policies, and global frameworks on digital inclusion and early childhood development. The paper identifies critical barriers to effective technology integration in Nigerian ECE settings, including inadequate digital infrastructure, limited internet connectivity, insufficient funding, low levels of teachers' digital competence, and unequal access to digital learning resources among children from diverse socio-economic backgrounds. Particular attention is given to the experiences of children with disabilities and those residing in rural and underserved communities, who remain disproportionately affected by digital exclusion. The paper further highlights the transformative potential of educational technologies, assistive technologies, digital learning platforms, and teacher professional development programmes in promoting inclusive and equitable learning opportunities. It argues that bridging the digital divide requires coordinated investments in infrastructure, capacity building, policy implementation, and stakeholder collaboration to ensure

universal access to quality early childhood education. The paper concludes that technology integration represents a strategic pathway for fostering educational equity, social inclusion, and future-ready learning environments capable of supporting the developmental needs of all children in Nigeria.

Keywords: *Digital Divide, Early Childhood Education, Technology Integration, Educational Inclusion and Equity and Access.*

410. Bridging the Digital Divide in Nigerian Colleges of Education under the Dual Mandate: A Review of Equity, Access and Inclusion

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The Federal Colleges of Education Act, 2023, authorizes Nigeria's Colleges of Education to confer both the Nigeria Certificate in Education (NCE) and Bachelor's degrees as part of the Dual Mandate policy. Yet, the policy's success in improving teacher education and enhancing the institutions' competitiveness hinges on bridging the digital divide. This review analyzes efforts to address digital disparities in Nigerian Colleges of Education under the Dual Mandate, emphasizing equity, access, and inclusion by synthesizing literature from 2020 to 2026. It discusses issues related to ICT infrastructure, internet access, financial constraints, digital literacy, and assistive technologies. While these challenges impact all students, those in host communities, from low-income families, female students, and students with disabilities face greater risks due to insufficient digital resources. The review identifies barriers to integrating digital technology, such as poor ICT infrastructure, unstable power supply, limited internet connectivity, inadequate funding, low digital literacy, and the lack of inclusive policies. It recommends ongoing investment in digital infrastructure and training for staff and students, free access to digital and assistive tools, development of inclusive policies, and partnerships to bridge the digital divide and support the Dual Mandate's effective implementation.

411. Bridging the Gap in Language and Communication Studies in Higher Education Ecosystems in Africa through the Use of Digital Resuorces and Technologies

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The integration of digital resources in language and communication is a phenomenon that is sweeping across every aspect of human endeavour, including higher educational institutions in Africa. Unfortunately, there is a noticeable gap in the pace with which higher institutions in Africa are responding to digitalization demand. This study explores the ways in which technology influences communication and language studies in higher institutions in Africa, the associated challenges and the way forward. The study is qualitative in nature and anchored on the critical mass and the diffusion of innovations theory propounded by Kaye and Medoff (2001) and Rogers (1962) respectively. The study reveals that the use of digital resources in higher institutions has experienced significant growth, but there are many challenges that beset its effectiveness in Africa. The findings highlight the potential of technology to connect students across institutions and backgrounds, fostering cross-cultural understanding and collaboration. Ultimately, the paper suggests that concerted efforts by stakeholders should be geared towards addressing the issues of access and equity in the provision of digital resources in higher institutions across Africa. The paper concludes that no institution of higher learning can make any meaningful impact in the present global world without adequate integration of information communication facilities into its programmes.

Keywords: *Language, Communication, Digital, Innovation, Technology.*

412. Community Participation as a Driver of Inclusive Education: Examine Student's Enrolment, Attendance, Retention and Academic Performance in Yobe State, Nigeria

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Across Africa, improving equitable access to quality education and ensuring meaningful student participation remain major priorities for building future-ready education systems. Despite various educational reforms and increasing stakeholder involvement, many schools continue to experience challenges that affect students' educational outcomes. In Yobe State, Nigeria, concerns persist regarding students' enrolment, attendance, retention, and academic performance in junior secondary schools. These challenges may be associated with inadequate educational resources, limited support services, insufficient school facilities, and weak community involvement in school development and

decision-making processes.. The study was guided by four objectives: to determine the relationship between community participation and students' enrolment, attendance, retention, and academic performance in junior secondary schools in Yobe State, Nigeria. A correlational research design was adopted using quantitative methods. Data were collected through a five-point Likert scale questionnaire and document review. The study population comprised 24,646 JSS III students, 1,202 teachers, 134 principals, 2,010 School-Based Management Committee members, and 1,870 Parent–Teacher Association members. A sample of 1,380 respondents was selected using the Research Advisor sampling table (2006). The instruments were validated through expert review and pilot testing, with a reliability coefficient of 0.81. Data were analysed using descriptive statistics and multiple regression at a 0.05 level of significance with the aid of SPSS. The findings revealed significant relationships between community participation and students' enrolment, attendance, retention, and academic performance in junior secondary schools in Yobe State. The results indicate that stronger community engagement contributes to improving students' access to education, sustained participation, school continuity, and learning achievement—key dimensions of inclusive education. The study concluded that strengthening partnerships among government, communities, School-Based Management Committees, Parent–Teacher Associations, and other stakeholders can enhance inclusive educational development and support resilient, future-oriented learning environments. The study recommends sustained community engagement initiatives and continued investment in school support structures to improve equitable educational outcomes.

413. Cradling Books and Digital Screens: A Qualitative Descriptive Study of On-Campus Student-Mothers Navigating Blended Learning in Nigerian Higher Education

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Digital transformation in higher education has introduced blended learning models that combine physical classroom lectures with mobile apps, online portals, and digital assignment submissions. While these technologies aim to provide flexibility, they create unique everyday pressures for on-campus female students who are also nursing mothers or primary caregivers. This paper investigates the everyday experiences of undergraduate student-mothers as they navigate digital learning tools, mobile data demands, and academic schedules alongside maternal responsibilities. The study adopts a qualitative descriptive research design to provide a straightforward, comprehensive summary of the participants' real-life experiences in their natural setting. Data were collected from 18 purposively selected undergraduate student-mothers across different academic faculties using in-depth semi-structured interviews and open-ended reflective questionnaires. The qualitative data were analysed using inductive thematic analysis to identify recurring patterns without imposing rigid theoretical constraints. The findings reveal three major operational themes: The Mobile Screen as a Double Burden: Smartphone notifications and late-night online submissions often blur the boundary between home care and academic study, increasing mental fatigue. Resource Competition: Student-mothers frequently face trade-offs between purchasing internet data for class portals and meeting urgent household and childcare expenses. Finally, Informal Coping Mechanisms: Participants heavily rely on collaborative peer networks and asynchronous voice messaging (such as WhatsApp audio notes) to catch up on missed digital coursework. The study concludes that digital learning policies in African higher education must move beyond a "one-size-fits-all" model. It offers practical recommendations for faculty and institutional leadership, including adopting low-bandwidth mobile content, flexible digital submission windows, and institutional child-friendly digital study spaces on campus.

Keywords: *Gender and Technology, Student-Mothers, Blended Learning, Qualitative Descriptive Research, Higher Education in Nigeria, Digital Inclusion.*

414. Digital Access and Equity in Nigerian Higher Education: Creating Inclusive Pathways for the Digital Age

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The rapid growth of digital technology is reshaping higher education, creating new opportunities for teaching, learning, research and collaboration. However, these opportunities are not equally available to all students in Nigeria. Differences in access to reliable internet, digital devices, electricity, affordable data, digital skills and supportive learning environments continue to create significant barriers to meaningful participation in digital education. Consequently, while digital transformation promises greater flexibility and wider access to higher education, it can also deepen existing inequalities when the needs of disadvantaged learners are overlooked.

This paper examines digital access and equity in Nigerian higher education, with particular attention to the practical challenges that prevent students from fully benefiting from digital learning opportunities. The paper adopts a conceptual and analytical approach, drawing on existing literature, policy documents and relevant reports on digital education and inclusion. It argues that achieving meaningful digital inclusion requires more than providing technological infrastructure; it demands deliberate attention to affordability, digital literacy, accessibility, inclusive pedagogy, reliable electricity, institutional support and the diverse circumstances of learners. The paper proposes practical pathways for creating a more inclusive digital higher education system through strengthened infrastructure, affordable connectivity, improved digital competencies, accessible learning platforms, lecturer capacity development, strategic partnerships and responsible integration of emerging technologies, including artificial intelligence. The paper concludes that Nigeria's digital transformation of higher education will only be sustainable and meaningful when technology serves as a bridge to educational opportunity rather than another source of exclusion. Ensuring that every learner can access, participate in and benefit from digital education should therefore remain at the heart of Nigeria's higher education transformation agenda.

Keywords: *Digital access, digital equity, digital inclusion, digital literacy, inclusive education*

415. Digital Access, Inclusion And Equity In Sub-Saharan Africa: An Empirical Analysis

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The study examines the nexus between inclusion, equity and digital access in Sub-Saharan Africa, with emphasis on the extent to which disparities in digital infrastructure, affordability, skills and socioeconomic conditions shape access to digital technologies and services. Despite the rapid expansion of mobile connectivity and digital platforms across the region, significant gaps persist between urban and rural populations, income groups, genders and other socioeconomic categories. The study seeks to assess the determinants of digital access and evaluate how digital inclusion can promote equitable participation in economic and social activities. Using relevant secondary data and appropriate econometric techniques, the study will investigate the relationship between digital access, socioeconomic conditions and inclusive development across selected Sub-Saharan African countries. The findings are expected to provide evidence for policymakers on strategies for reducing the digital divide, improving affordable and reliable connectivity, strengthening digital skills, and promoting equitable access to digital opportunities. The study contributes to the growing literature on digital transformation and inclusive development by highlighting the importance of addressing structural inequalities that constrain meaningful digital participation in Sub-Saharan Africa

416. Digital Colonialism or Digital Sovereignty? The Political Economy of Foreign Tech Platforms in Reimagining Africa's Higher Education Ecosystems

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The rapid adoption of foreign digital platforms—Google Classroom, Microsoft Teams, Zoom, Coursera—by African universities post-COVID has been framed as “bridging the digital divide.” However, this shift raises critical political economy questions about power, data, and long-term development autonomy. This study employs a political economy and development studies lens to interrogate whether Africa’s digital transformation of higher education is fostering digital sovereignty or reproducing digital colonialism. Drawing on dependency theory and the concept of data extractivism, the paper examines three dimensions: 1) ownership and control of digital infrastructure and user data; 2) implications of platform dependence for curriculum design, academic freedom, and institutional governance; and 3) the role of African states, regional bodies like AUDA-NEPAD, and universities in negotiating alternative, “future-ready” digital ecosystems. Using policy document analysis and semi-structured interviews with ICT directors and university management in select North-Central Nigerian Federal Universities, the study argues that while foreign platforms offer short-term access, their proprietary models, subscription costs, and data harvesting practices create structural dependencies that undermine Africa’s vision of self-reliant, inclusive higher education. The paper concludes with policy recommendations for building regional cloud infrastructure, open-source alternatives, and regulatory frameworks that reposition Africa as a producer, not just consumer, of digital education technologies.

Keywords: *Digital Sovereignty; Digital Colonialism; Political Economy; Higher Education; Africa*

417. Digital Equity in Nigerian Higher Education: Establishing Students' Inclusiveness Network for Accessing Digital Learning

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This study investigates digital equity in Nigerian higher education, with a focus on establishing a Students' Inclusiveness Network (SIN) as a framework to enhance equitable access to digital learning opportunities. The study will specifically examine students' access to digital learning resources, the hindrances to students' participation in digital learning, the existing support systems, and propose an inclusive network model that will promote access to digital learning. Using a cross-sectional survey, data will be collected from students of selected universities, polytechnics, and colleges of education in Nigeria through a structured questionnaire. While Descriptive statistics involving mean and standard deviation will be used to analyse the research questions, regression analysis will be employed to test hypotheses at a 0.05 significance level using SPSS. The study will give empirical data on digital inequality types and levels obtainable in the Nigerian higher education context and also design a Students' Inclusive Network framework that includes: Infrastructural students' support, low-network-connection scheme, accessibility to devices and gadgets, and inclusive students' support services. The findings will contribute to the formulation of policies and strategies for promoting digital inclusion and ensuring equitable access to digital learning opportunities for all learners in Nigerian higher education institutions.

418. Digital Inclusion, Human Capital Formation and Poverty Reduction in African Higher Institutions of Learning

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The digital revolution has transformed higher education globally by expanding access to knowledge, enhancing learning opportunities, and fostering skill development. However, many African higher institutions of learning continue to experience significant disparities in access to digital technologies, creating barriers to educational participation and socioeconomic advancement. These inequalities limit the ability of students, particularly those from disadvantaged backgrounds, to acquire the competencies required for effective participation in the emerging knowledge economy. This paper examines the role of digital inclusion as a catalyst for human capital formation, equity of access, and poverty reduction in African higher institutions of learning. The study adopts a narrative and descriptive review methodology, drawing extensively on existing theoretical and empirical literature. The analysis is anchored on Human Capital Theory, Digital Divide Theory, and Dependency Theory to provide a comprehensive understanding of the relationship between digital inclusion, educational equity, and poverty reduction within the African context. The paper finds that digital inclusion enhances students' access to quality educational resources, promotes digital skills acquisition, and improves opportunities for employment and income generation. The study concludes that digital inclusion is a critical driver of equitable human capital formation and sustainable poverty reduction in Africa. It recommends increased public and private investment in digital infrastructure, affordable internet access, digital literacy programmes, and inclusive higher education policies aimed at ensuring that all students can participate effectively in the digital economy.

419. Digital Innovation for Inclusive Higher Education in Colleges of Education in Bauchi State, Nigeria: Bridging Access, Equity, and Future-Readiness”

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Nigeria’s higher education sector including universities, polytechnics, and colleges of education is at a pivotal moment in its digital transformation journey. With millions of learners across diverse institutions, the challenge of bridging the digital divide remains urgent. Persistent issues such as limited infrastructure, unequal access to digital tools, and gaps in digital literacy threaten to widen disparities among students and educators. This paper examines how digital innovation can reimagine Nigeria’s higher education ecosystem to be inclusive, equitable, and future-ready. Ultimately, the paper argues that Nigeria can become a continental leader in digital innovation if stakeholders academics, policymakers, industry leaders, NGOs, and students commit to scalable and collaborative solutions. The study calls for collective action to connect, collaborate, innovate, and transform Nigeria’s higher education landscape, ensuring that no learner is left behind in the digital era.

420. Digital Learning Access and Utilisation among Undergraduates in Plateau State, Nigeria

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Digital learning provides university students with opportunities to access electronic libraries, online courses and other academic resources. Nevertheless, limited internet connectivity, high data costs and inadequate access to suitable devices may restrict participation. This study assesses digital learning access and utilisation among undergraduates in Plateau State, Nigeria. A cross-sectional survey design is proposed, involving 400 undergraduates selected through multistage sampling. Data will be collected using a Digital Learning Access and Utilisation Questionnaire and analysed using frequencies, percentages, Pearson correlation, chi-square tests and analysis of variance, as appropriate. In the hypothetical results, 90.0% of respondents had access to a smartphone, 55.0% had regular access to a laptop or desktop, 54.0% reported reliable internet access, 36.0% considered data subscriptions affordable and 62.0% frequently used digital learning resources. Internet affordability was positively associated with digital learning utilisation ($r = .39$, $p < .001$), while device access was significantly associated with frequent use, chi-square$(1) = 12.64$, $p < .001$. A group comparison also indicated significant differences in utilisation, $F(2, 397) = 4.86$, $p = .008$. The results suggest that digital learning participation may be constrained by affordability and unequal access. The study recommends improved campus connectivity, affordable internet services, device-loan schemes and expanded electronic library resources.

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Keywords: *Digital Learning, Internet Access, Digital Divide, Undergraduates, Educational Equity*

421. Empirical Analysis of the Relationship between Financial Inclusion, Information and Communications Technology (ICT) and Human Development in Nigeria

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Nigeria with HDI score of 0.560 in 2023 occupies 164th position in the HDI ranking and was thus placed among nations with medium human development. Some of the factors that contribute to this include poverty, inequality, low access to capital and technology among others. Access to formal and informal financial resources and services as well as digital technologies has the potential to improve living standards by expanding economic opportunities, enhancing access to education and healthcare, promoting entrepreneurship and reducing poverty. Many policy measures were implemented by Nigerian governments aimed at enhancing financial inclusion and ICT adoption. However, the extent to which these policy measures contribute to human development remains unresolved. Against this background, this study analyses the relationship between financial inclusion, ICT and human development in Nigeria from 1990 to 2023. Using annual time-series data for Nigeria, the study utilizes the HDI as the proxy for human development, financial inclusion is measured by financial Institutions access Index, while ICT is captured by mobile cellular subscriptions and internet usage (percentage of the population using the internet). The study employed structural vector autoregressive (SVAR) technique on data covering the period 1990 – 2023, to explore both the long-run and short-run dynamic relationships among the variables. The findings revealed the existence of a long-run relationship among financial inclusion, ICT, and human development. Specifically, financial inclusion and ICT were found to have positive effects on human development, implying that improved access to financial resources and services and enhanced digital connectivity lead to improvements in education, health outcomes, level of income and overall welfare. The results further indicated that positive shocks to financial inclusion and ICT generate improvements in human development. The study recommends that government and other stakeholders should promote inclusive financial development and strengthen digital infrastructure in order to accelerate human development in Nigeria.

422. Equity in Digital Access and It's Influence on Early Childhood Learning Outcomes in Conflict-Affected Communities of Zamfara state, North-West Nigeria

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Digital inequity poses a critical threat to early childhood development, particularly in fragile, conflict-affected contexts where structural vulnerabilities intersect with systemic exclusion. In North-West Nigeria, sustained insecurity has displaced communities, decimated educational infrastructure, and widened pre-existing digital divides, leaving early learners disproportionately marginalised. This study examined equity in digital access and its influence on early childhood learning outcomes in conflict-affected communities of Zamfara and Kebbi States. Specifically, it assessed the availability of digital learning tools, determined the extent of gender-based disparities in digital access, and evaluated the influence of administrative planning on the allocation of digital resources in ECCDE centres. Three corresponding research questions guided the inquiry. A descriptive survey design was adopted; the population comprised ECCDE teachers, head teachers, and local government education planners. Multistage sampling yielded 240 respondents. A structured questionnaire, validated by three experts and pilot-tested (r=0.81), served as the instrument. The mean, standard deviation, and Pearson's correlation were used for data analysis. Findings revealed significant inequities in digital access strongly correlated with diminished learning outcomes. The study recommended strengthened administrative frameworks, gender-responsive digital provisioning, and context-sensitive ECCDE digital policies for conflict-affected communities.

423. Fintech, Financial inclusion and Economic Growth: Evidence from Nigeria's Digital Revolution

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This study examines the impact of financial inclusion and digital financial innovation on economic growth in Nigeria. Anchored on endogenous growth theory and the finance-growth nexus, the paper measures financial inclusion using private sector credit and physical bank density, while digital innovation is provided by mobile money, POS, and ATM transaction channels. Using the Autoregressive Distributed Lag (ARDL) bounds test, the result reveals a long-run cointegrating relationship among the variables in the long run, both improved financial access and digital banking channels have a significant positive effect on Real GDP. However, short-run error correction estimate shows that the initial rollout of fintech solutions create adjustments cost and structural bottleneck, producing temporary negative growth effects before their full benefits materialize.The significant negative error correction term confirms that the deviation from long run equilibrium are corrected rapidly.Therefore, the study recommends a targeted policy action to address infrastructural gaps, modernise regulatory frameworks and reduce demographic desperities in access to finance.

Keywords: *Fintech Innovation, Financial Inclusion, Economic Growth, ARDL*

424. From Digital Access to Fair Assessment: A Simulation-Based AI-Assisted Psychometric Evaluation Framework for African Higher Education

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Background: As universities expand computer-mediated assessment, inequalities in device access, connectivity, digital competence, and learning settings challenge the interpretation of digital test scores. Objective: To systematically synthesise relevant full-text studies and demonstrate a reproducible framework linking Classical Test Theory (CTT), Rasch measurement, two-parameter logistic item response theory (2PL IRT), differential item functioning (DIF), and machine-learning risk prediction. Methods: A 76 documents; 34 directly relevant full texts were extracted and synthesised narratively. For the separate methodological experiment, 30 binary items and two hypothetical digital-access groups were simulated, with six items assigned uniform disadvantage of 0, 0.6, or 1.2 logits. Eighty Monte Carlo replications were performed under each of six sample-size/effect conditions (N = 500 or 1,500); a 2,000-examinee synthetic sample illustrated CTT, Rasch, 2PL, DIF, and predictive analyses. Results: The literature distinguishes access barriers from proof of item bias and supports complementary psychometric and AI audits. In the illustrative synthetic sample, Cronbach's alpha was 0.841, while all six programmed DIF items were identified without false flags. Across Monte Carlo conditions, mean DIF sensitivity ranged from 0.435 (N = 500; 0.6-logit penalty) to 1.000 (N = 1,500; 1.2-logit penalty). Logistic regression (AUC = 0.520) and gradient boosting (AUC = 0.488) showed weak held-out prediction from access indicators alone. Conclusion: Reliability, conditional item comparability, and AI prediction are distinct questions; reproducible combined audits are feasible but require empirical validation before decisions about actual African university students.

Keywords: *Digital assessment; Digital divide; Assessment fairness; Classical Test Theory; Rasch measurement; Item Response Theory; Differential Item Functioning; Monte Carlo simulation; Educational artificial intelligence.*

425. Gender Disparities in Digital Technology Access among ECCDE Caregivers in Zamfara State, North-West Nigeria

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This study investigated gender disparities in digital technology access among Early Childhood Care, Development, and Education (ECCDE) caregivers in Zamfara State, North-West Nigeria. Despite constituting over 80% of the ECCDE workforce, female caregivers remain disproportionately excluded from digital technology access and the professional development opportunities it enables. The study was guided by three objectives: to determine the level of digital technology access among male and female ECCDE caregivers in Gusau Educational Zone; to examine gender-based differences in digital literacy competencies; and to identify institutional and socio-cultural barriers constraining female caregivers' access to digital technologies. Correspondingly, three research questions were raised and addressed. A descriptive survey research design of the correlational type was adopted. The population comprised all ECCDE caregivers in Zamfara State, while the study was delimited to Gusau Educational Zone encompassing Gusau, Bungudu, Maru, and Tsafe Local Government Areas. A sample of 120 caregivers was drawn from 60 ECCDE schools within the zone, with two caregivers purposively selected per school. The instrument for data collection was the 20-item Gender-based Digital Technology Access among ECCDE Caregivers Questionnaire (GDTAECCDEQ), validated through expert review and pilot testing. Findings revealed a statistically significant gender gap in digital technology access ($t = 7.84$, $p < 0.05$), with female caregivers scoring markedly lower across all access and digital literacy indicators. Economic constraints, spousal restriction, and the absence of institutional ICT training emerged as the most prominent barriers. The study recommends that Zamfara State Government urgently formulate a gender-responsive digital inclusion policy for the ECCDE sub-sector, that ZSUBEB and UNICEF jointly provision digital devices to government centres across Gusau Educational Zone, and that ECCDE administrators integrate gender-sensitive digital literacy training into all caregiver professional development programmes

426. Gendered digital literacies and inclusive higher education; Bridging inequalities in Access, Participation and Knowledge production in Global south

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The increasing digitalization of higher education has transformed how knowledge is accessed, produced, and disseminated across the globe. Yet, the promise of digital innovation remains unevenly realized, particularly in the Global South, where structural inequalities continue to shape educational opportunities. While existing studies on the digital divide have largely emphasised access to digital technologies and infrastructure, comparatively less attention has been paid to the gendered dimensions of digital literacy and their implications for participation in academic knowledge production. Drawing on insights from gender studies and literacy scholarship, this paper argues that digital inclusion extends beyond access to encompass the ability to critically and meaningfully engage with digital literacy, and that disparities in digital literacy development and academic confidence influence learners' participation within higher education. Through a critical review of relevant literature, the paper highlights the ways in which gender continues to mediate engagement with emerging digital learning environments. It contends that bridging the digital divide requires a shift from access-centred approaches to gender-responsive, critical digital literacy interventions that promote equitable knowledge production and digital citizenship. Such interventions are essential for fostering more inclusive higher education systems and for ensuring that digital innovation contributes to educational equity and social transformation in the Global South.

Keywords: *Gendered digital literacies; digital divide; higher education; knowledge production; inclusion; Global South.*

427. Gendering Digital Innovation on the Use of Reggio Emilia Early Childhood Pedagogical Approach, in the Evolving Global Dynamics

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The gendering evolving digital tools is critical in shaping early childhood development approaches. The global gender equity and equality pattern may be use to influence production and integration of digital technologies within the Reggio Emilia approach to Early Childhood Development (REA-ECD). Rooted in child-centered, constructivist philosophy, the Reggio Emilia approach emphasizes the use of all environmental resources to facilitate collaborative teaching and learning for increasing creativity, and soft skills for social interaction. The rise in the digital technologies have introduce new opportunities and challenges, particularly in relation to gender access and participation. Using a qualitative-analytical framework supported by synthesized empirical and illustrative survey data, the paper intended to explores gender access patterns and disparities in the use of digital pedagogy and learning outcomes. It may further investigates global trends in shaping ECD in a digitalization sustainability. Findings indicate that, the use of digital tools enhance documentation, creativity, and collaboration. It can vanish the persistent gender gaps in the access opportunity to digital tools in pedagogies. The paper may recommends gender-responsive digital policies, inclusive training, and culturally relevant practices to ensure safer, equitable and sustainable gendered early childhood development.

Keywords: *Gender, Digital Innovation, Reggio Emilia, Early Childhood Development, Global Dynamics*

428. Governance and Security Implications of Digital Identity Systems in Africa

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Digital identity systems have emerged as a cornerstone of Africa's e-governance, financial inclusion, and development agenda. Yet the rapid deployment of national identification infrastructure across the continent has outpaced the formulation of robust governance frameworks and the implementation of adequate security controls. This paper examines the governance and security implications of digital identity systems across six purposively selected African countries: Nigeria, Kenya, South Africa, Ghana, Rwanda, and Ethiopia. Guided by two study objectives, the paper investigates (1) the adequacy of governance frameworks regulating digital identity systems in terms of legal architecture, institutional capacity, and interoperability, and (2) the security vulnerabilities inherent in these systems alongside the effectiveness of existing mitigation strategies. Using a qualitative-interpretive comparative case study methodology anchored in Institutional Theory and Sociotechnical Systems Theory, the analysis draws on legislative texts, policy documents, cybersecurity audit reports, and peer-reviewed literature published between 2020 and 2026. Findings reveal significant legislative fragmentation, weak enforcement capacity, and an underdeveloped pan-African interoperability architecture. Security risks are endemic across infrastructure, application, data, and user layers. The paper concludes by proposing the African Digital Identity Governance and Security (ADIGS) Framework as an integrative model for policy reform and institutional capacity-building.

Keywords: *digital identity, cybersecurity governance, Africa, biometric systems, data protection, ADIGS framework*

429. Government ICT Policy Frameworks and Equitable Digital Access in African Public Universities: A Political Economy Analysis of the Digital Divide

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The rapid digitalization of higher education across Africa has exposed deep-seated disparities in access to digital infrastructure, raising urgent questions about the role of government policy in either bridging or entrenching the digital divide. This study examines the relationship between national ICT policy frameworks and the level of equitable digital access among students in public universities, using a political economy lens to interrogate how governance choices shape technological outcomes in higher education. Drawing on comparative case data from selected African countries, the research employs a mixed-methods design, combining policy content analysis with survey data on student digital access, device ownership, and e-learning participation rates. Preliminary conceptual analysis suggests that variations in policy commitment—particularly funding allocation, regulatory support for public-private EdTech partnerships, and rural broadband expansion—correlate significantly with disparities in student digital inclusion, disproportionately affecting learners in rural and low-income institutions. The study argues that without deliberate, equity-oriented policy design, digital transformation initiatives risk reproducing existing structural inequalities rather than resolving them. Findings are expected to contribute to ongoing debates on digital governance in higher education by offering evidence-based recommendations for policymakers, university administrators, and development partners seeking to build future-ready, inclusive higher education ecosystems. This paper aligns with the conference's call to bridge the digital divide by foregrounding the political and institutional determinants of digital equity, offering a

governance-focused complement to the largely technical and pedagogical discourses that dominate current digital education scholarship.

Keywords: *ICT policy, digital divide, higher education governance, digital inclusion, political economy, Africa*

430. Inclusion Strategies for Early Childhood Care and Education (Ecce) Access among Internally Displaced Persons (Idps) in Host Communities of Zamfara State, Nigeria

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This study examined inclusion strategies to enhance Early Childhood Care and Education (ECCE) access for internally displaced persons (IDPs) in host communities in Zamfara State, Nigeria. Three objectives guided the study: identifying barriers to IDP children's access to ECCE, assessing the inclusion strategies adopted by host community schools, and determining the relationship between these strategies and IDP children's enrolment and participation. A descriptive, correlational survey design was adopted, with a population comprising ECCE caregivers and head teachers in public primary schools across the Gummi, Anka, and Maradun (Mafara) educational zones. A stratified random sample was drawn to ensure proportional representation across zones. A researcher-designed questionnaire served as the instrument. It was pilot-tested on a sample outside the study area and yielded a Cronbach's Alpha reliability coefficient of 0.78. Data were collected through direct administration and analysed using descriptive statistics (frequencies, percentages, and means) and the Chi-square test for hypothesis testing. Findings revealed that inclusion strategies were inadequately implemented, characterised by overcrowded classrooms, a shortage of trained personnel, language barriers, and limited psychosocial support, which significantly contributed to low IDP enrolment. A significant relationship was established between inclusion strategies and access outcomes. These findings corroborate Adebayo and Musa (2021) and UNICEF (2022), who similarly reported infrastructural deficits and weak teacher preparedness as major impediments to displaced children's educational integration in Northern Nigeria. The study recommends intensive teacher capacity-building in inclusive pedagogy, provision of adapted learning materials and expanded infrastructure, and sustained community sensitisation programmes to strengthen the integration of IDP children into host community ECCE centres.

431. Inclusion, Equity and Digital Access to Information

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This is an age where the generation, creation, access and or the dissemination of information across the globe through digital technologies has gained currency. The unequal access to digital resources including information resources continues to create disparities among individuals and communities. Inclusion, equity and digital access to information are related concepts that seek to ensure all people, regardless of socioeconomic status, gender, age, disability, geographic location, or cultural background, can effectively participate in the digital world. This paper examines the concepts of digital inclusion and equity, explores barriers to digital access, and discusses strategies for promoting equitable access to information. The study highlights the importance of affordable internet connectivity, digital literacy, accessible technologies, and supportive policies in bridging the digital divide. It concludes that achieving digital equity is essential for social justice, economic development, educational advancement, and democratic participation in the twenty-first century.

432. Inclusive Libraries: Africa"S Digital Path to Rethinking Higher Education

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Inclusive libraries are uniquely positioned among higher education institution to deliver equitable digital access across African higher education. Although investment in educational technology and smart campuses infrastructure has gained momentum, most national strategies still relegate libraries to peripheral support roles, treating them as content warehouses rather than public knowledge ecosystems. Persistent challenges include underfunding, print-centric mandates, weak digital infrastructure, inconsistent policy integration, and limited staffing for inclusion. This paper examines the future of equitable higher education in Africa through an analysis of how inclusive libraries can anchor digital transformation through accessible infrastructure, open educational resources, and critical digital literacy. It explores how repositioned libraries can deploy low-bandwidth platforms, offline-ready repositories,

assistive technologies, zero-rated access agreements, and community-based digital hubs to bridge divides for students facing geographic, economic, or disability-related barriers. The paper highlights inclusive libraries as a key framework for designing flexible, distributed systems that address diverse learner needs. However, significant obstacles remain, including digital inequity, insufficient funding, unstable connectivity, limited institutional capacity, lack of training in digital inclusion, and weak oversight of accessibility standards. The paper argues that technology's promise for equity is real but benefits only materialize with intentional library-led infrastructure, effective policy execution, and sustained investment in inclusive digital systems. Conclusion were made that achieving equitable higher education in Africa requires coordinated efforts among governments, universities, funding bodies, and library consortia to re-center libraries as digital public goods. Recommendations were made to include ring-fenced funding for inclusive library infrastructure, strategic professional development, and upholding digital accessibility standards, among others.

Keywords: *Inclusive libraries; Digital infrastructure; Higher education; Africa; Educational equity; Open educational resources; Digital divide; Library policy; Digital accessibility*

433. Linguistic Capital in the Digital Market: Localization of Yoruba Orthography and the Socio - Economic Inclusion of South West Nigerian Traders

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The rapid digitalization of the Sub-Sahara Africa financial landscape has incongruously deepen a digital divide rooted in language. While English remains the default language of mobile banking apps, e-commerce platforms, and point-of-sales (POS) interfaces, themajority of actors in the informal economy of South West Nigeria rely primarily and in some cases solely on the Yoruba language. The paper draws on Bourdieu's theory of Linguistic capital, and the techno-linguistic marginalisation framework, to investigate how localisation of digital financial interfaces in Yoruba drives economic empowerment and digitalinclusion. The study adopts a mixed-methods socio- linguistic approach. First, it performs a structural text and corpus analysis of translation strings and automated audio prompts used by leading Nigerian Fintech platforms, such as Agentpesa and Dailybills. The paper evaluates the accuracy of diacritics, semantic shift, and the lexical adaptation into Yoruba of some complex financial terminologies, such as interest rates, transfers, and tokens. Secondly, semi structured interviews and usability observations was conducted with 60 market actors across Oyo and Ondo States. Preliminary findings indicate that proper orthographic engineering and culturally resonate tone-accurate audio prompts significantly reduce transaction anxiety, lower user error rates, and increase financial autonomy among non-English literate traders. Conversely, the frequent omission of diacritics in SMS alerts and application user interfaces creates semantic ambiguity, resulting in financial mistrust, and systematic exclusion. The paper argues that Yoruba language is not merely an instrument for cultural preservation but a vital economic asset for traders. It concludes by recommendingactionable policy frameworks for collaboration between Yoruba linguists, software developers, and regulatory bodies like NITDA, to standardize language localisation in the digital economy.

434. Mobile Learning: A Tool for Bridging the Digital Divide among Biology Students in State and Federal Colleges of Education in Central Nigeria

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This paper examines mobile learning as a tool for bridging the digital divide among Biology students in State and Federal Colleges of Education in Central Nigeria. The study discusses the growing importance of mobile technologies in teacher education and explores how smartphones, tablets, and internet-enabled devices can improve access to educational resources. Differences in digital access, infrastructure, connectivity, and technological skills between institutions and learners continue to create educational inequalities. Through a review of relevant literature and theoretical perspectives, the paper highlights the role of mobile learning in enhancing access, engagement, collaboration, and academic achievement among Biology students. The paper concludes that effective adoption of mobile learning can significantly reduce educational disparities and recommends policy interventions, infrastructure development, and capacity-building programmes for lecturers and students.

435. Multilingual Digital Inclusion: Role of Indigenous Languages and Nigerian Pidgin in Making Oers and LMS Accessible in Nigerian Colleges of Education

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This paper explores the role of indigenous languages and Nigerian pidgin in making Open Educational Resources (OERs) and Learning Management Systems (LMS) accessible in Nigerian Colleges of Education. Despite the expansion of digital learning platforms, over 60% of Nigerian Colleges of Education students face exclusion due to linguistic barriers in OERs and LMS that are predominantly in Standard English (UNESCO, 2024). This paper examines how multilingual digital inclusion can bridge the digital divide and promote equity in teacher education in Nigeria. Grounded in Cummins' (2000) Linguistic Interdependence Hypothesis and Warschauer's (2003) model of meaningful digital access, the study argues that scaffolding digital concepts in Hausa, Igbo, Yoruba and Nigerian Pidgin increases operational and informational literacy among first-generation and rural learners. Using a mixed-methods approach, data were collected from a pilot study at two Colleges of Education, where LMS glossaries, video subtitles and WhatsApp tutorials were localized. Findings indicate a 34% increase in students' engagements and a 28% reduction in drop-off from online modules when content was presented in L1 before English. The paper further proposes a Core Curriculum Minimum Academic Standard (CCMAS)-aligned framework for "Localization Clusters" within Language Departments to train pre-service teachers as digital translators and content creators. It concludes that without linguistic equity, digital transformation faces high risks of deepening exclusion. Recommendations of the paper include NCCE/NUC mandates for multilingual OERs, TETFund support for Language-Tech Labs and partnerships with Wikimedia Nigeria for indigenous language content creation.

Keywords: *Multilingual education, digital inclusion, OERs, LMS, Nigerian languages and equity.*

436. Promoting Inclusive and Accessible Education for Students with Disabilities in Rwanda: Challenges, Opportunities and Reform Strategies

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Inclusive and accessible education is essential for ensuring that all learners, including students with disabilities, have equal opportunities to access, participate in, and benefit from quality education. Although Rwanda has made significant commitments to inclusive education through national policies, legal frameworks, and educational reforms, students with disabilities continue to experience barriers that affect their full participation and academic achievement. These barriers may include inaccessible physical learning environments, limited availability of assistive technologies and learning materials, inadequate teacher preparation, communication challenges, negative attitudes, limited specialized support services, and gaps between inclusive education policies and their implementation in schools. This study aims to examine the challenges and opportunities associated with promoting inclusive and accessible education for students with disabilities in Rwanda and to propose practical reform strategies for improving educational access, participation, and learning outcomes. The study will employ a mixed-methods research approach, combining quantitative and qualitative methods to obtain comprehensive evidence from students with disabilities, teachers, school administrators, parents, policymakers, and other relevant stakeholders. Data will focus on the accessibility of school infrastructure, teaching and learning resources, assistive technologies, teacher competencies, support services, school policies, and stakeholder attitudes toward disability inclusion. The study will identify existing gaps between policy intentions and educational practices while examining opportunities for strengthening inclusive education through teacher capacity development, universal design for learning, assistive technology, accessible infrastructure, stakeholder collaboration, and effective monitoring and accountability mechanisms. The study is expected to contribute evidence-based recommendations for education reforms that can strengthen Rwanda's commitment to equitable, inclusive, and accessible education. Its findings will be useful to policymakers, education institutions, teachers, disability organizations, and other stakeholders in developing sustainable strategies that ensure students with disabilities are not only enrolled in education but are meaningfully included, supported, and empowered to achieve their full potential.

Keywords: *Inclusive Education; Accessibility; Students with Disabilities; Education Reform.*

437. Reimagining Academic Libraries as Catalysts for Future-Ready Learning Ecosystems: A Position on Sustainable Educational Development in Africa

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The increasing use of advanced technology tools, such as digital technologies, Artificial Intelligence (AI), cloud computing, virtual reality, big data analytics, digital scholarship platforms, and knowledge-driven economies, has

greatly changed tertiary institutions around the world, with academic libraries also being impacted as they are recognized as essential components of future-ready learning environments. Despite the growing integration of these technologies in African higher education institutions, challenges such as insufficient infrastructure, limited funding, digital exclusion, skill gaps, and unequal access to information resources continue to exist, obstructing sustainable educational advancement. Libraries should be regarded as strategic catalysts for effective educational development rather than merely as fountains of information resources, as they play a crucial role in bridging the divide between technology, information access, and educational innovation within Smart learning environments. Based on the current discourse surrounding digital transformation, AI-enabled library services, digital literacy, and sustainable education, this paper maintains that academic libraries hold a critical and central role in promoting digital inclusion, fostering innovation, and supporting sustainable educational development within the changing educational setting. By fulfilling their roles in research support and innovation, facilitating digital inclusion, promoting AI literacy and usage, and encouraging lifelong learning, academic libraries can significantly contribute to achieving one of the Sustainable Development Goals (SDG 4: Quality Education) and enhance knowledge humanities throughout Africa. The paper recommends the technological empowerment of academic libraries should be prioritised to strengthen their initiatives in constructing future-ready educational frameworks and knowledge societies in Africa. It concludes that the evolution of academic libraries into intelligent, inclusive, and technology-driven learning centers is essential for establishing resilient and future-ready educational environments.

438. Smart Campus Infrastructure and Digital Connectivity as Drivers of Higher Education Transformation in Nigerian Colleges of Education: a Case Study of Federal College of Education Jama'Are

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The increasing integration of digital technologies into higher education has transformed the manner in which teaching, learning, research, and institutional management are conducted across the world. Smart campus infrastructure and digital connectivity have emerged as critical drivers of educational innovation, institutional efficiency, and knowledge accessibility. This paper examines the role of smart campus infrastructure and digital connectivity in promoting higher education transformation in Nigerian Colleges of Education, with specific reference to the Federal College of Education (FCE) Jama'are. The study adopts a descriptive survey and conceptual analysis approach, drawing on contemporary literature and contextual realities of tertiary education in Nigeria. The paper explores the dimensions of smart campus infrastructure, assesses the significance of digital connectivity in educational delivery, identifies challenges hindering implementation, and proposes strategies for sustainable digital transformation. Findings indicate that smart classrooms, campus-wide internet access, digital learning platforms, electronic administration systems, and ICT-enabled instructional practices significantly enhance educational quality and institutional effectiveness. However, inadequate funding, unstable electricity supply, limited technical expertise, poor internet penetration, and resistance to technological change remain major obstacles. The paper concludes that strategic investment in smart campus infrastructure is essential for repositioning Colleges of Education as centres of innovation and excellence capable of meeting the demands of twenty-first-century education.Keywords: Smart Campus, Digital Connectivity, Educational Transformation, Higher Education, Colleges of Education, FCE Jama'are, Digital Learning.

439. Social Studies, Ethnic Integration and Future-Ready Education among Junior Secondary Students in South-South Nigeria

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The development of future-ready education in Africa requires learners to acquire not only academic and digital competencies but also the values needed for peaceful coexistence in culturally diverse societies. This study will evaluate the effectiveness of Social Studies in promoting ethnic integration among Junior Secondary School students in South-South Nigeria and examine its implications for future-ready education. The study will focus on the extent to which Social Studies objectives, content, teaching methods and evaluation practices promote tolerance, respect for ethnic diversity, cooperation and social cohesion. Four research questions and four hypotheses will guide the study. A survey research design will be adopted. The population will comprise 400,572 Junior Secondary School students in the 2023/2024 academic session, from whom 13,730 students will be sampled from 50 public and 50 private schools. Data

will be collected using a five-point Likert-scale questionnaire validated by three experts, while reliability will be established using Cronbach's alpha. Mean, standard deviation and t-test will be used for data analysis at the 0.05 level of significance. The study is expected to provide evidence on the contribution of Social Studies to ethnic integration, inclusive citizenship and socially sustainable education. The findings will offer implications for curriculum development and teaching practices that support inclusive, cohesive and future-ready education ecosystems in Nigeria and Africa

440. Technology Integration in Teacher Preparation for Inclusive Early Childhood Education of Children with Special Needs in Nigeria: Challenges and the Way Forward

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The growing influence of digital technologies in education has created new possibilities for improving teaching and learning outcomes, particularly for children with special needs. In inclusive early childhood education, technology serves as a valuable tool for supporting individualized instruction, enhancing communication, promoting active participation, and addressing diverse learning needs. As educational systems increasingly embrace digital innovation, the preparation of teachers to effectively integrate technology into inclusive classroom practices has become a critical concern. In Nigeria, however, many early childhood educators enter the profession with limited exposure to technology-based instructional strategies and insufficient training in the use of digital and assistive tools for supporting children with disabilities.

This paper examines the state of technology integration in teacher preparation for inclusive early childhood education of children with special needs in Nigeria. It highlights the importance of equipping pre-service and in-service teachers with the competencies required to utilize technology effectively in diverse learning environments. The paper identifies major challenges, including inadequate technological infrastructure, limited access to digital devices, insufficient professional development opportunities, poor funding, weak policy implementation, and gaps in teacher education curricula. These constraints continue to hinder the effective use of technology in fostering inclusive learning experiences for young children with special educational needs.

The paper argues that meaningful inclusion in the digital age requires a comprehensive approach that prioritizes teacher capacity development and access to appropriate technological resources. It recommends curriculum reforms, continuous professional training, improved funding mechanisms, stronger institutional support, and strategic partnerships among stakeholders. Addressing these challenges will enhance teacher effectiveness and contribute to the provision of equitable, inclusive, and high-quality early childhood education for all children in Nigeria.

441. The Application of Artificial Intelligence in Enhancing Teaching and Learning Processes for Students in Inclusive Educational Schools

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Artificial Intelligence (AI) has become an innovative technology that is transforming educational systems by improving teaching and learning processes, particularly in inclusive educational settings. This study examined the application of Artificial Intelligence in enhancing teaching and learning processes for students in inclusive educational schools. Specifically, the study investigated the role of AI in promoting personalized learning, improving accessibility for learners with special educational needs, enhancing teachers' instructional effectiveness, and identifying the challenges associated with AI implementation in inclusive schools. A descriptive survey research design was adopted for the study. The target population comprised teachers and students in selected inclusive educational schools, while a sample of 200 respondents, consisting of 50 teachers and 150 students, was selected using multistage sampling techniques. Data were collected using a structured questionnaire titled “Application of Artificial Intelligence in Inclusive Education Questionnaire (AAIIEQ)”. The data were analyzed using descriptive statistics, including frequency counts, percentages, mean scores, and standard deviations. The findings revealed that Artificial Intelligence significantly enhances personalized learning, improves classroom participation, facilitates assessment and feedback, and supports learners with disabilities through assistive technologies. However, inadequate ICT infrastructure, insufficient teacher training, high implementation costs, and concerns relating to data privacy were identified as major challenges affecting the effective integration of AI in inclusive educational schools. The study concluded that Artificial Intelligence has the

potential to improve educational quality and promote inclusive learning when supported by adequate infrastructure, appropriate policies, and continuous teacher capacity development. It was therefore recommended among others that governments, educational institutions, and other stakeholders should invest in AI technologies, teacher training, and digital infrastructure to ensure effective implementation of AI in inclusive education.

Keywords: *Artificial Intelligence, Inclusive Education, Teaching and Learning, Educational Technology, Students with Special Needs, Assistive Technology*

442. The Impact of E-Commerce and Digitalization on International Trade in Sub-Saharan Africa

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This research investigates the impact of e-commerce and digitization on international trade in Sub-Saharan Africa. It focused on export and import activities from 2000 to 2022. The study aims to assess the overall effect of e-commerce and digitization on international trade, specifically analyze their impact on exports, and examine their influence on imports within the region. The study employed the System Generalized Method of Moments (GMM) for econometric analysis of data sourced from the World Bank's World Development Indicators for 43 countries in Sub-Saharan Africa to ensure robust results. Innovation, trade openness, economic growth, FDI, human capital development, natural resources availability, and exchange rate, were employed as control variables to enhance the robustness of the specified models. The findings reveal that e-commerce measured with ICT goods imported has a positive and significant effect on both exports and imports, while digital technology measured with internet usage and mobile cellular subscriptions was found to be unrelated with either exports or imports. However, the study identified challenges such as infrastructure gaps, uneven technological adoption, and regulatory inconsistencies, which limit the potential benefits of digitized trade. The research concludes by recommending policy strategies that focus on enhancing digital infrastructure, harmonizing regulations, and fostering e-commerce adoption to further boost international trade in the region.

443. Utilizing Assistive Technology in the Educational and Vocational Rehabilitation of Adolescents with Visual Impairment in Nigeria: Pathway to Inclusion, Equity and Access

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As education and work settings become more digital, visually impaired teenagers in Nigeria still face a serious risk of being left behind. As a substitute of benefiting fully from modernization, many continue to experience barriers to access, participation, and skill development. This demonstrates the importance of integrating assistive technology into education in practical ways that support inclusion, equity, and meaningful use. Using the social model of disability and transition theory, this paper examines the challenges that affect learners with visual impairment as they move from school into vocational training and employment. It highlights a clear gap between the assistive technology provided in schools, the demands of post-school vocational education, and preparation for employment. The paper also identifies limited inclusion in TVET settings and insufficient support for teachers involved in vocational and employment education as key factors weakening successful inclusion. To respond to these issues, the paper proposes a whole assistive technology system approach that connects education, employment, and career development during the transition to adulthood. It argues that both special education teachers and vocational educators need proper training in the use of assistive technology. The paper also stresses the need for affordable, locally relevant solutions that can widen workforce participation. Relating school-based assistive technology support with employment-focused interventions, the paper offers a broader understanding of inclusion. It concludes that the systematic use of assistive technologies does more than improve access; it strengthens development, supports employability, and empowers visually impaired young people to participate more fully in society.

Research, Innovation and Knowledge Ecosystems

47 abstracts

Research capacity, open science, partnerships and the visibility of African scholarship.

444. A Multimodal and Robust Deepfake Detection Framework for Safeguarding Digital Integrity in Short-Form Video Learning Environments

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The rapid proliferation of AI-generated deepfake videos on short-form platforms such as TikTok poses an emerging threat to digital integrity, particularly within higher education contexts where learners increasingly consume user-generated content as informal learning resources. Existing deepfake detection methods remain largely unimodal, brittle under real-world compression, and disconnected from fact-checking mechanisms leaving educational ecosystems vulnerable to persuasive misinformation. This study addresses these gaps by designing, developing, and empirically validating a novel Multimodal and Robust Deepfake Detection Framework (MRDF) tailored for short-form video environments. Grounded in Design Science Research, the proposed framework integrates three core modalities visual (facial and motion artifacts), audio (speech synthesis anomalies), and textual (captions and transcribed claims) using attention-based fusion to capture cross-modal inconsistencies. Robustness is achieved through platform-aware simulation of compression, noise, and adversarial perturbations, while a retrieval-augmented semantic verification module assesses factual consistency against trusted knowledge bases (e.g., WHO, Africa Check). Evaluation using benchmark datasets (FaceForensics++, DFDC, FakeAVCeleb) and platform-simulated conditions demonstrates that MRDF significantly outperforms unimodal and non-robust baselines in detection accuracy, cross-dataset generalization, and resilience to distortion. Furthermore, the framework's explainability module provides interpretable outputs, supporting human-in-the-loop moderation. For higher education institutions, MRDF offers a blueprint for next-generation content authentication systems, enabling educators, librarians, and administrators to identify AI-generated misinformation before it reaches learners. By bridging technical detection with semantic verification, this research contributes to building future-ready, trustworthy digital learning ecosystems across African universities and beyond.

Keywords: *Deepfake detection, multimodal learning, short-form video platforms, AI misinformation, higher education, TikTok, fact-checking, robust AI*

445. Acute Toxicity Study and Phytochemical Analyses of Crude Methanolic Extract of Indigofera Hirsute Aerial Parts

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lndigofera hirsuta is a Nigerian medicinal plant used traditionally for the treatment of several diseases such as wound healing, analgesic, diuretics, antibacterial, anti-inflammatory while the leaves serves as chief sources of green manure for improving soil fertility among others. The aim of the study is to conduct preliminary toxicity study, qualitative and quantitative phytochemical analysis of crude methanol extract of I. hirsute aerial part. The plant material were extracted with methanol for 48 h and the resulting extract was subjected acute toxicity study and phytochemical analyses using Lorke's method and standard procedures. The LD50 of the crude methanol extract of the plant was estimated to be 1131.3mg/kg indicating that the extract is relatively toxic. Additionally, the qualitative phytochemical screening of the extract revealed the presence of flavonoids, steroids, alkaloids, tannins, saponins, cardiac glycosides and anthraquinones while quantitative evaluation of the same extract indicated the concentrations of these metabolites to be flavonoids (270.039+0.013 mg/l00g), steroids (9.100±0.007 mg/l00g), alkaloids (59.74±0.014 mg/l00g), tannins (21.66+0.03 mg/l00g), saponins (1.3+0.0001 mg/l00g) and anthraquinones (0.205+0.003 mg/100g). Thus, the preliminary findings of the study expose the plant's rich bioactive phytochemical that could be responsible for it therapeutic quality in traditional medicine.

Keywords: *Acute toxicity, Indigofera hirsute, phytochemicals, traditional medicine*

446. AI Tools Acquaintances and Science Teacher Education: Implications for Physics Education Innovation and Technological Development in Abia State Nigeria

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The Integration of Artificial Intelligence (AI) tools have become a norm in virtually every sector of the global economy and in Educational sector with its potentials and intervening challenges. This study underscores the importance of AI Literacy in teacher education and innovative technological development in Africa. The study reveals the need for educators and relevant government agencies to prioritize the adaption of AI innovative tools in teacher education to enable teachers integrate meaningfully AI tools in education to enhance teaching and learning environment create innovativeness and bridge digital divide. The study showed that AI provides analytical tools, empowering teachers to make real time students' data analyses thereby saving time for teacher to engage in other meaningful pedagogical activities, provide tools which automate pedagogical instruction and administrative processes making learning more engaging and ensuring organizational efficiency. Moreover, the study revealed that AI tools empowers teachers to personalize learning, provide targeted support , enhancing accessibility to learners which makes room for students with learning disabilities to cope in education, provide data driven insight to improve on teaching strategies. AI tools also makes learning to be motivating and engaging empowering teachers to equip students with skills and knowledge to feature credibly into future workforce. However, the study identifies challenges AI integration into Education poses which include potential data biases, ambiguous bride of intellectual property IP rit, ethical issues such as unlawful exposure of students personal data, over dependence on AI which can undermine teacher student interaction needed for emotional support, creative thinking, problem solving skills which could impair students' performance in real world, trivializing of teachers role in education with consequential job loss to robotics using AI technologies in education. However, the study recommends in-job training to teachers on the use of AI in education, stressing the need to strike a balance creating synergy in education between AI integration and real time teacher inputs in education and also ensuring AI governance to regulate data storage and retrieval.

Keywords: *Physics, AI, digital divide, data-biase, Intellectual property.*

447. Analysis of Aeromagnetic Data for Subsurface Lineaments Framework Guiding Crop Productivity within Eastern Niger Delta, Nigeria

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The oil-rich Eastern Niger Delta, Nigeria is characterized by extensive low-lying terrain, complex drainage networks, unconsolidated sediments, groundwater dependent communities, and intensive agricultural activities. Beneath the thick sedimentary sequence are a network of geological structures that may influence groundwater movement, drainage, soil-moisture distribution, sediment accumulation, and the spatial variability of agricultural land conditions. This study investigates the use of aeromagnetic data to delineate subsurface lineaments and evaluate their possible implications for crop productivity within the Eastern Niger Delta, Nigeria. The results from the total magnetic intensity (TMI) map and RTP map revealed that the study area is magnetically heterogeneous. Magnetic susceptibility ranges from -46.2nT to 174.9nT. There are areas of low, intermediate, and high magnetic susceptibilities corresponding to sediments with low, moderate and high magnetic mineral deposits. Furthermore, the lineament map, total horizontal derivative map and the rose diagram delineated and confirmed the presence of linear structures which are interpreted as faults, and fractures with N-S, NNE, NE, SW and SSE trends possibly due to basement intrusion. These linear structures are pathways for groundwater migration. The result from the Euler Deconvolution map also revealed a wide range of depths to magnetic sources (940.6m to 8674.8m). This wide range of depths to magnetic sources explains the undulated nature of the basement topography. The average sediment thickness is estimated as ~1275.5m. The interpreted lineament framework, magnetic susceptibility distribution and thick sedimentary sequence is a geological control measure that may indirectly influence groundwater availability, drainage, moisture retention, and soil development. Therefore, this study provides a geophysical basis for integrating subsurface structural information into agricultural-land assessment and sustainable crop-management planning in the Eastern Niger Delta.

Keywords: *Aeromagnetic Data, Magnetic Lineaments, Subsurface Structures, Eastern Niger Delta, Crop Productivity, Groundwater*

448. Artificial Intelligence and Customer Relationship Management: Addressing Customer Service Delivery Challenges in MTN Nigeria, Abakaliki

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Background: The increasing application of Artificial Intelligence (AI) in Customer Relationship Management (CRM) has transformed the delivery of customer services, particularly through automated responses, chatbots, intelligent self-service platforms and data-driven customer support. Objective: This study evaluated the effectiveness of AI tools in addressing customer service delivery challenges in MTN Nigeria, with specific focus on customer complaints, inquiries and churn in Abakaliki, Ebonyi State. Methodology: A cross-sectional survey design involving 385 MTN subscribers was used. Data were collected from respondents through a structured questionnaire administered electronically using Google Forms; same were analysed using descriptive statistics and weighted mean analysis. Findings: Findings indicated high level of awareness and usage of MTN's AI-powered customer-support tools, with 78% of respondents reporting awareness and usage. It further showed that 64% of respondents rated the AI tools as effective or excellent in understanding their queries, while 67% considered the solutions provided accurate or very accurate. Though AI tools were predominantly used for data bundle and airtime-related enquiries; there were limitations in service responsiveness, as 40% of respondents reported that AI was either slower and more frustrating or failed to resolve their issues. Conclusion and Recommendations: AI tools have considerable potential to improve customer service delivery in MTN Nigeria, particularly in handling routine inquiries, but their effectiveness in resolving complex complaints and supporting customer retention remains dependent on appropriate human intervention; hence MTN should adopt a hybrid customer-service model that combines AI automation with timely access to human agents to improve complaint resolution, customer satisfaction and retention.

Keywords: *Artificial Intelligence, Customer Relationship Management, Customer Service, Customer Complaints, Customer Inquiries, Customer Churn, MTN Nigeria.*

449. Artificial Intelligence, Public Policy and the Sustainability of Efik Abang Dance Music Towards Transformative Higher Education in Africa

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The sustainability of indigenous musical traditions in Africa faces challenges arising from inadequate documentation, limited digital resources and weakening opportunities for intergenerational transmission. These concerns are particularly significant for Abang dance music (ADM) of the Efik kingdom in Cross River State, Nigeria, whose cultural richness extends beyond musical performance to include dance, storytelling, material culture and community knowledge. This study examines how AI-informed public policy can support the preservation and revitalisation of ADM within the broader agenda of transformative higher education in Africa. Guided by Cultural Sustainability Theory and Technological Determinism Theory, it adopts a qualitative ethnographic approach involving participant observation, oral interviews with Abang practitioners and relevant educational and policy stakeholders, as well as documentary analysis of cultural, educational and digital policy frameworks. Findings highlight opportunities for AI-assisted documentation, archival preservation, musical analysis, pedagogical integration and wider dissemination. They also reveal ethical, infrastructural and policy challenges concerning indigenous ownership, contextual integrity, data governance, digital access and technological appropriation. The study argues that AI can contribute meaningfully to cultural sustainability when guided by culturally responsive public policy and active community participation. Rwanda's emphasis on digital transformation provides a relevant policy context for reflecting on technology-enabled educational transformation in Africa, rather than a comparative case. The study proposes an AI-informed cultural education policy framework linking indigenous knowledge preservation, responsible technological innovation and transformative higher education. It concludes that digital transformation must advance technological capacity while safeguarding cultural agency and indigenous knowledge systems.

Keywords: *Artificial Intelligence, Public Policy, Abang dance Music, Mbono Iban Ison Efik, Cultural Sustainability, Higher Education Transformation.*

450. Assessment of Information and Communication Technology (ICT) Integration into Teaching and Research Activities in Colleges of Education in North-East Nigeria

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This study assessed the integration of Information and Communication Technology (ICT) into teaching and research activities in Colleges of Education in North-East Nigeria. The study was motivated by the growing importance of ICT in enhancing instructional delivery, research productivity, and the overall quality of teacher education. Specifically, it examined the availability of ICT facilities, the extent of ICT integration in teaching and research, the ICT competence of academic staff, and the challenges affecting effective ICT utilization. A descriptive survey research design was adopted. The population comprised academic staff from the twenty-one Colleges of Education in North-East Nigeria, while five colleges were selected through a multistage sampling technique. Data were collected using a validated questionnaire, and reliability was established using Cronbach's Alpha coefficient of 0.70. Descriptive statistics, including mean scores and standard deviations, were used for data analysis. The findings revealed that ICT facilities are generally available in the selected colleges, although advanced technologies such as interactive whiteboards and video conferencing facilities remain inadequate. The study further showed that ICT is integrated into teaching and research activities to a high extent, and that academic staff possess a relatively high level of ICT competence. However, challenges such as inadequate infrastructure, poor internet connectivity, irregular power supply, insufficient funding, limited training opportunities, and inadequate technical support continue to hinder effective ICT integration. The study concluded that while significant progress has been made in ICT integration, addressing existing infrastructural and institutional challenges is essential for enhancing teaching and research effectiveness in Colleges of Education in North-East Nigeria.

451. Brain-Inspired Neuromorphic Systems Readiness and Digital Skills Development for Future-Ready Higher Education and Industrial Transformation in Africa

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The emergence of neuromorphic computing, which combines principles of human brain functionality with advanced artificial intelligence and low-power computing, presents new opportunities for developing sustainable digital ecosystems and preparing graduates for future technology-driven industries. The study examined the readiness of higher education institutions to adopt brain-inspired neuromorphic systems as a pathway for strengthening digital skills development and supporting industrial transformation in Africa. To achieve the objectives, four research questions and four hypotheses was formulated for the study. A correlational research design was adopted for the study. The population comprised lecturers and final-year students in computer science, and Industrial Technology Education in Nigerian Universities. Sample was selected using multistage sampling techniques. Data were collected using a researcher-developed instrument titled Neuromorphic Technology Readiness and Digital Skills Development Questionnaire (NTRD-SDQ). The instrument was validated by experts in Industrial Technology Education, Computer Engineering, Measurement and Evaluation, while reliability was established using Cronbach Alpha reliability method. Mean and standard deviation were used to answer the research questions, while Pearson Product Moment Correlation and multiple regression analysis were used to test the hypotheses at 0.05 level of significance. The study is expected to reveal the extent to which digital competencies, institutional technology readiness and curriculum preparedness predict readiness for neuromorphic computing education. The findings will provide evidence-based recommendations for universities, policymakers and industry stakeholders on developing future-ready higher education ecosystems, reducing Nigerian digital skills divide and promoting sustainable industrial transformation

452. Bridging the Digital Divide: Reimagining Future-Ready Mathematics Education Ecosystems in African Higher Education

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The paper focused on bridging the digital divide: reimagining future-ready mathematics education ecosystems in African higher education, addressing the impact of digital divide on the teaching and learning of mathematics despite global continuous growth in technology and digitalization. The main objective was to examine the concept and evolution of the digital divide in mathematics education and proposes a future-ready mathematics education ecosystem for African higher education. The paper adopted a conceptual research design based on a critical review and synthesis of recent literature, policy documents, and international reports. Guided by the Digital Divide Theory and the Technological Pedagogical Content Knowledge (TPACK) framework, the paper explores the changing dimensions of the digital divide and their implications for mathematics education. The findings revealed that the digital divide has evolved beyond inequalities in access to technology to include disparities in digital competencies, AI readiness,

technology utilisation, and educational outcomes. The paper further identified inadequate broadband infrastructure, poor electricity supply, limited funding, insufficient digital skills, weak policy implementation, rural–urban disparities, and limited access to mathematics-specific technologies as the major barriers to digital transformation in African universities. The paper argues that developing future-ready mathematics education ecosystems requires integrated investments in digital infrastructure, AI-supported learning, adaptive assessment, cloud-based collaboration, Open Educational Resources, digital pedagogy, institutional leadership, continuous professional development, industry partnerships, inclusive digital policies, and sustainable funding. It recommended increased government investment in digital infrastructure, continuous capacity building for mathematics educators, curriculum reforms integrating AI and computational thinking, stronger public–private partnerships, and equitable digital inclusion policies. The paper concludes that bridging the digital divide is essential for improving mathematics learning outcomes, strengthening graduate employability, fostering innovation, and advancing progress toward Sustainable Development Goal 4 (Quality Education) in African higher education.

453. Bridging the Digital Treaty: From Access Gaps to Ecosystem Justice

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Despite unprecedented global digital expansion, current approaches to closing the digital divide remain fundamentally insufficient. Mainstream interventions narrowly focus on infrastructure connectivity, treating inclusion as a technical problem of extending networks rather than a structural problem of re-configuring power, design, and governance. This paper argues that achieving genuine digital equity requires a paradigm shift from a charity model to a treaty model. This paper examines three persistent failures of current digital inclusion efforts which include the innovation without accountability trap, the participation-washing problem, and the equity measurement vacuum. The study advanced a concrete alternative, an ecosystem-in-action model that integrates community-based participatory research, frugal innovation sprints, and open knowledge repositories. The paper further argues that the digital treaty must be enforceable, not aspirational. The research proposed binding accountability mechanisms, including sunset clauses for non-inclusive digital services, community veto power over data extraction, and publicly funded digital equity impact assessments as prerequisites for government technology procurement. Without a treaty framework, the study concluded that digital transformation will continue to replicate and deepen existing inequalities, offering faster pathways to privilege while leaving the structurally excluded further behind.

454. Building Climate-Resilient Knowledge Ecosystems: Leveraging Farmer Perception, Innovation, and Multi-Stakeholder Collaboration for Food Security in Nigeria

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Climate variability is undermining agricultural productivity and livelihoods across Sub-Saharan Africa, threatening progress toward the Sustainable Development Goals. In Nigeria's Guinea Savanna zone, smallholder farmers experience firsthand the effects of shifting rainfall patterns, increased temperature, and new pest pressures. However, scientific research and indigenous knowledge often exist in silos, limiting the translation of evidence into practical, locally owned innovations. This disconnect weakens the capacity of research and innovation ecosystems to deliver societal and economic impact. This study examines how strengthening research, innovation, and collaboration within agricultural knowledge ecosystems can enhance resilience and food security, using Ogbadibo Local Government Area of Benue State, Nigeria, as a case. The paper draws on findings from a mixed-methods survey of 120 smallholder farmers, 8 key informant interviews with extension agents, and 4 focus group discussions with farmer cooperatives. The research assessed farmers' perceptions of climate change, perceived effects on yam, cassava, maize and vegetable production, and existing adaptation strategies. Results indicate that 78% of farmers perceived delayed onset of rains and increased dry spells between 2010 and 2025. Perceived impacts include 20-30% yield reduction, poor tuber quality, and increased post-harvest losses due to heat and humidity. Despite this, adaptation remains fragmented. Only 34% of farmers had access to climate-smart information through extension, while indigenous innovations such as adjusted planting calendars, mixed cropping, and drought-tolerant varieties were widely practiced but not documented or scaled. The study argues that impactful innovation requires a functional knowledge ecosystem where researchers, extension services, TVET institutions, farmers, and policymakers co-create and co-disseminate solutions. We propose a Quadruple Helix collaboration model that integrates academic research, government policy, industry/TVET, and farmer knowledge to accelerate the development and adoption of climate-smart agricultural

technologies. Strengthening this ecosystem has direct societal impact through improved household food security and income, and economic impact through reduced crop losses and increased marketable surplus. The paper concludes with recommendations for institutionalizing farmer-researcher feedback loops, funding collaborative innovation hubs at LGA level, and aligning agricultural extension with national climate policy to ensure research translates into measurable development outcomes.

Keywords: *Knowledge ecosystem, Research collaboration, Agricultural innovation*

455. Climate-Resilient Water, Sanitation and Public Health Systems in Africa: Strengthening Community Resilience in a Changing Climate

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Climate change, rapid urbanisation and population growth are placing increasing pressure on water and sanitation systems across Africa, with significant consequences for public health and community resilience. Floods, droughts, water scarcity and inadequate sanitation infrastructure contribute to the spread of waterborne diseases, undermine healthcare delivery and disproportionately affect vulnerable populations. This paper examines the need for integrated, climate-resilient water, sanitation and public health systems as a pathway to strengthening community resilience in African settings. It explores how innovative water management, improved sanitation, climate-smart infrastructure, community participation and stronger institutional collaboration can reduce health risks associated with climate-related water challenges. The paper further highlights the importance of linking public health institutions, universities, government agencies and local communities in designing sustainable and context-specific solutions. It argues that investment in resilient water and sanitation infrastructure, supported by evidence-based policies, digital innovation and community engagement, is essential for achieving sustainable development and protecting population health. The paper concludes by proposing an integrated framework for building resilient water, sanitation and health systems capable of responding effectively to Africa's emerging climate and environmental challenges.

Keywords: *Climate resilience; Water security; Sanitation; Public health; Community resilience; Africa; Climate change; Sustainable development*

456. Coupled Fixed-Point Theorems for Banach-Type Contractions in b-Suprametric Spaces with an Application to Stability Analysis of Adaptive Learning-Path Recommendation

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The rapid digital transformation of higher education in Africa has increased the need for intelligent and personalized learning systems capable of adapting to heterogeneous learner needs while maintaining stable, reliable learning pathways. Although adaptive learning-path recommendation offers significant potential for learner-centered education, mathematical frameworks for analyzing the convergence and stability of successive personalized recommendations remain relatively underdeveloped. This study develops a mathematically grounded framework for stable and personalized adaptive learning-path recommendation using coupled fixed-point theory in b-suprametric spaces.

Precisely, the study investigates Banach-type contractive mappings defined on complete b-suprametric spaces and establishes sufficient conditions for the existence and uniqueness of coupled fixed points. An associated coupled iterative scheme is formulated, and conditions ensuring its convergence to the coupled fixed point are derived. The stability of the iterative process is subsequently analyzed under controlled perturbations of learner states - simulating real-world variables such as unpredictable internet connectivity, erratic system interaction, and varying study paces - and the adaptive recommendation mapping. To demonstrate the applicability of the theoretical results, a conceptual mathematical model is formulated in which learner knowledge states, learning progress, and learning-path states are represented within a b-suprametric framework. An adaptive mapping represents successive personalized recommendations, while learning-analytics data from standard digital environments is incorporated as state information influencing the recommendation process. The resulting coupled fixed point is interpreted as a stable, personalized learning configuration, and the convergence and stability results provide mathematically verifiable criteria for the consistency and robustness of successive recommendations.

The novelty of the proposed framework lies in connecting coupled fixed-point analysis in b-suprametric spaces with a mathematical model of personalized adaptive learning-path recommendation. The framework provides a rigorous basis for analyzing the reliability and stability of adaptive learning algorithms, offering a foundation for integrating robust recommendation engines into modern Learning Management Systems (LMS). In the long run, the study contributes to the broader goal of developing future-ready higher-education ecosystems in Africa through mathematically rigorous approaches to personalized digital learning.

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Keywords: *b-Suprametric spaces; coupled fixed points; Banach-type contractions; convergence and stability; personalised adaptive learning; learning analytics; learning-path recommendation.*

457. Curriculum Innovation and Workforce Readiness among Students in Higher Education Institutions in Cross River State, Nigeria

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This study examined curriculum innovation and workforce readiness among students in higher education institutions in Cross River State, Nigeria. Two objectives guided the study: to examine the influence of technology-based curriculum innovation on workforce readiness among students in tertiary institutions in Cross River State, Nigeria, and to assess the influence of entrepreneurship-based curriculum innovation on workforce readiness among students in tertiary institutions in Cross River State, Nigeria. The study adopted a survey research design. The population comprised students, academic staff, entrepreneurship education lecturers, curriculum planners, information and communication technology instructors, and administrators in selected tertiary institutions in Cross River State. The sample size for the study was determined using the Taro Yamane sample size determination method, while an appropriate sampling technique was used to select respondents from the selected institutions. Data were collected using a structured questionnaire titled “Curriculum Innovation and Workforce Readiness Questionnaire (CIWRQ).” Experts in curriculum studies, educational management, entrepreneurship education, and measurement and evaluation validated the instrument. Reliability was established using the Cronbach Alpha method. The data collected were analyzed using mean and standard deviation. The findings revealed that technology-based curriculum innovation and entrepreneurship-based curriculum innovation positively influenced workforce readiness among students in tertiary institutions in Cross River State. The study concluded that curriculum innovation enhances students’ digital competence, entrepreneurial awareness, employability skills, creativity, problem-solving ability, and readiness for the modern labour market. The study recommended that higher education institutions should strengthen the integration of digital technologies into teaching and learning, promote entrepreneurship-based curriculum practices, and provide practical learning experiences that prepare students for employment, self-employment, and workplace demands.

458. Dietary Effect of Terminalia catappa Linn Leaf Meal and its Polyphenolic Extract on the Growth, Sperm Quality and Biochemical Enzymes of African Catfish (Clarias gariepinus) Broodstock

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The study assess the growth, sperm quality and some biochemical indices of an African Catfish (Clarias gariepinus) broodstock fed a plant (an almond plant, Terminalia catappa) (T. catappa) with a view of providing information on the potential toxicity of the plant. The experimental diets was fed to two hundred and forty (240) apparently healthy juvenile C. gariepinus divided into groups of eight (8) fish per tank in triplicate. The experimental diet were fed to the fish at 3% of the body weight in two instalments six days a week for a period of 150 days. The growth performance, feed utilization, gamete and seed qualities were evaluated during this studies using standard fisheries techniques. The results showed that the group of C. gariepinus fed 10 mg/kg polyphenol powder T. catappa amended diets had significantly ($p < 0.05$) higher mean weight gain compared to those fed the other experimental and the control diets. The fish fed 100 mg/kg T. catappa leaf powder and 10 mg/kg polyphenol meal included diet had significantly higher ($p<0.05$) fecundity and hatchability compared to the fish fed other diets. Spermiation was highest in the fish fed 50 mg/kg T. catappa leaf powder amended diet. The liver and plasma enzymes activities were found to be significantly higher ($p <0.05$) in all the treatment containing T. catappa leaf powder amended diets and the control diets. The study concluded that enhancement of C. gariepinus broodstock fed with 100 mg/kg of T. catappa leaf powder significantly improved the gamete and seed qualities in the fish.

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Keywords: *Terminalia catappa, Growth performance, Haematology, Biochemical enzymes, Clarias gariepinus*

459. Digital Surveillance and Knowledge Systems for Neglected Tropical Disease Research: Prevalence of Helminth Parasites among Secondary School Children in Chikaji, Sabon Gari, Kaduna State,...

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Soil-transmitted helminthiases, a leading neglected tropical disease (NTD), remain poorly monitored in many Nigerian school communities because continuous, data-driven surveillance systems are largely absent. This study determined the prevalence of helminth infections among children associated with Great Bright Star Secondary School, Chikaji, Sabon Gari, Kaduna State, examining 418 stool samples collected between 2022 and 2025 by conventional microscopy (zinc sulphate-sucrose flotation). Overall prevalence rose steadily from 28.7% in 2022 to 38.5% in 2025. Children aged 0-4 years carried the highest and most rapidly increasing burden, reaching 66.7% by 2025, while male children generally recorded higher prevalence than females except in 2022 and 2023. This persistent, worsening trend went undetected in real time under the prevailing periodic, manually collected surveillance model, underscoring the case for integrating school health data into digital, data-driven surveillance capable of continuous monitoring, early trend detection, and evidence-based intervention planning. The study argues that higher education institutions and public health authorities across Africa should prioritise digital health-education infrastructure to close this surveillance gap in support of the region's broader digital transformation agenda.

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Keywords: *Helminths, prevalence, children, digital surveillance, knowledge ecosystems*

460. Education as the Nexus of Food Security: Reframing Tertiary Agricultural Pedagogy for Sustainable Development Goals Among Graduate Youth in Ogun State, Nigeria1Oni, O. Oluwakemi and 2Adeoye...

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Education as the Nexus of Food Security: Reframing Tertiary Agricultural Pedagogy for Sustainable Development Goals Among Graduate Youth in Ogun State, Nigeria1Oni, O. Oluwakemi and 2Adeoye A. Stephen1Department of Agricultural Education, School of Secondary Education (Vocational Education). Federal College of Education (FCE), Abeokuta. P.M.B.2096 Abeokuta Ogun State, Nigeria.2Department of Social Science and Humanities Studies. School of Secondary Education (General Studies in Education). Federal College of Education, Abeokuta. P.M.B 2096. Sapon Abeokuta. Ogun State, Nigeria. Abstract Reconceptualizing the nexus between human capital and food systems is paramount for the realization of the United Nations' Sustainable Development Goals (SDGs) within the African context. This investigation scrutinizes the engagement of Graduate Youth in sustainable agricultural practices and its implications for food security in the Odeda Local Government Area of Ogun State, Nigeria, through the framework of synchronizing higher education ecosystems with the prerequisites of future-oriented sustainable development. Employing a multi-stage sampling methodology, primary data was amassed from 112 rural youth participants via structured questionnaires and subsequently examined utilizing both descriptive and inferential statistical techniques. The results indicated a predominantly literate youth population (83.9% possessing formal education) who are actively involved in agricultural production (42.9%) and livestock rearing. Agriculture was found to play a substantial role in augmenting youth income ($\bar{x}$ = 2.68) and enhancing community food supply ($\bar{x}$ = 2.72). Nonetheless, participation is critically hampered by institutional and environmental constraints, including a deficiency of financial credit (x = 2.96), climate variability ($\bar{x}$ = 2.73), and insufficient extension services ($\bar{x}$ = 2.63). Importantly, Chi-square analysis illustrated a significant correlation between educational attainment and the youth's contributions to food security (χ^2 = 34.435, df = 3, $p < 0.05$), whereas other socio-economic variables demonstrated non-significance. This paper posits that mitigating the digital divide through the reform of tertiary agricultural curricula to incorporate smart AgriTech, sustainable skills, and digital extension methodologies is essential for transitioning graduate youth from subsistence roles to sustainable agripreneurship. The study concludes that the reconfiguration of the African higher education ecosystem is a strategic imperative for ensuring long-term food security and facilitating rural economic transformation.Keywords: Higher

Education Ecosystems; Digital Divide; Graduate; Youth Agripreneurship; Food Security; SDGs; Nigeria.

461. Entrepreneurship Education and Enterprise Development: A Catalyst for Self Reliance among Graduates of Higher Institutions in Nigeria

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The rising role of Entrepreneurship Education (EE) in enhancing economic growth and development globally presents opportunities for its use in developing enterprises for the achievement of self-reliance among graduates of higher institutions in Nigeria. This is a conceptual paper which examines the role EE can play in developing enterprises that can serve as a catalyst for self-reliance among graduates in Nigeria. The paper makes use of texts, diaries, journals, personal observations and immersions to obtain data. Content analysis was used in analyzing and interpreting available data. The findings of the study reveal that EE plays a significant role in enterprise development by equipping graduates with skills in areas of innovation, risk management and business operations. Consequently, self-reliance among graduates can be achieved by developing and establishing enterprises in areas of Information Technology (IT), Manufacturing and Agriculture. To achieve this, the paper recommended integration of more hands-on entrepreneurial training into the entrepreneurship curricula of higher institutions in Nigeria. Other measures include creation of youth-microfinance schemes to address startup capital gaps and investment in infrastructure to accelerate improvements in power and digital ecosystems to support IT driven enterprises.

Keywords: *Entrepreneurship Education, Enterprise Development, Self Reliance*

462. Examining sources of funding and challenges affecting research innovation and collaboration for societal and economic impact

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Research and innovation transform society by bringing practical solutions to societal problems. They address issues ranging from local to complex global concerns such as climate change, healthcare, and economic development by fostering collaboration among governments, academia, and industries to improve citizens' quality of life. Unfortunately, limited funding available for research and innovation in higher education institutions undermines their contributions; therefore, this study sought to examine available funding options and challenges affecting research and innovation in higher education institutions. The paper further provided insights into challenges our citadels of learning are confronted with in terms of over-dependence on government funding, poor research infrastructure, brain drain, weak institution-industry collaboration, and limited access to competitive grants, amongst others. It was concluded that sources of funds are limited, while there is still a dire need for more impactful research and innovations. Thus, recommendations were made to stakeholders in terms of increased government funding, strengthening university-industry collaboration, human capacity development, and encouragement of international collaboration.

Keywords: *Funding, Research, Innovation, and Economic Impact.*

463. Exploring the Impacts of Plantain Peel Powder on Yield Point-to-Plastic Viscosity Ratio in Drilling Mud

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This study presents the effect of plantain peel powder (PPP) as a green additive on the yield point-to-plastic viscosity ratio of water-based drilling muds (WBDM). In the upstream petroleum industry, the optimisation of non-Newtonian rheological properties is critical for effective wellbore cleaning and well integrity. Traditional synthetic additives such as carboxymethyl cellulose have economic and environmental drawbacks, and therefore eco-friendly alternatives are required. Direct ratio-based optimisation has been lacking; therefore, raw plantain peels were collected, sun-dried, ground and sieved to 0.15 mm. The FTIR, SEM and EDX characterisations indicated that PPP has many hydrophilic functional groups such as hydroxyl and carboxyl linkages and a porous microstructural network that promotes polymer swelling and pseudoplastic shear-thinning behaviour. The laboratory rheological evaluations, following standard API procedures, demonstrated that the mud formulations with 2.0 to 3.0 g of PPP maintained the YP/PV ratios within the optimal engineering window of 1.5 to 3.0, achieving an ideal balance between cuttings suspension

and minimised frictional pressure losses, avoiding risks such as barite sag or equivalent circulating density spikes. Further studies are recommended on long-term thermal stability at high temperature and pressure and shale hydration effects in reactive formations. Finally, the work contributes to the body of knowledge by demonstrating the role of the hydrophilic functional groups of PPPs in the optimisation of drilling mud performance and its effective operational parameters.

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464. Extended Speed-Range Performances of a Fixed Pitch Propeller Using an Optimized Z-Series Morphed Airfoil: Towards a Sustainable Aviation

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Fixed pitch propellers must compromise between high thrust during takeoff and efficient cruise performance. On the other hand, variable-pitch designs add significant weight, complexity, and cost to the propeller. This paper presents a new family of Z-series morphed airfoils generated through the Aero-structural Morphing Optimization Scheme (AMOS) to enable fixed-pitch propellers achieve an Extended Speed Range (ESR) characteristic. Using spline based parameterization and genetic algorithm optimization, 22 Z-series variants were created to meet radial specific targets: high $CLmax$ and CL,α=0 inboard for takeoff thrust, and delayed Mdd outboard for transonic cruise efficiency. A high-fidelity database of over 300 polar curves were generated via steady RANS CFD across Re = 2.5×10^5 – 3.0×10^6 (incompressible) and Mach 0.3–0.9 (compressible). Direct thickness-matched substitution of the Z-series sections into the experimental Navy-form Durand 3-ft model propeller (with no geometric changes) showed increased thrust by 67–75% and efficiency by 13.6–18.7% compared to the baseline R.A.F.- 6 configuration. Extension to a standard 9-ft Navy-form propeller with Mach-informed radial tailoring produced excellent ESR performance, achieving peak efficiency of $\eta \approx 0.93$ at cruise. These results demonstrate that the Z-series family offers a practical, drop-in upgrade over legacy airfoils (R.A.F.-6, Clark Y, NACA 16-series), delivering variable-pitch-like behavior in simple fixed-pitch designs. This work advances sustainable aviation with highly efficient propellers by providing a pathway to lightweight, high-performance propulsion systems for general aviation, UAVs, and electric aircraft.

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465. Financing & sustainable models for higher education innovation in Nigeria

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Financing remains a critical challenge confronting the effective administration of higher education in Nigeria. The sectoris characterized by recurrent industrial actions by staff unions,unstable academic calendars, student unrest, delayed payment of salaries,inadequate campus facilities, dilapidated infrastructure, and poor implementation of educational policies and programmes resulting from insufficient funding. Higher education plays a pivotal role in knowledge creation, innovation, human capital development,and socioeconomic transformation; therefore,sustainable financing is essential for fostering institutional innovation and ensuring long-term growth. The study examines financing and sustainable models for higher education innovation in Nigeria. Specifically, it explores traditional funding sources and emerging approaches capable of supporting sustainable financial frameworks for institutional innovation. The study also investigates strategies for financial diversification, effective resource management, as well as the challenges associated with inadequate funding and policy inconsistencies that impede innovation within higher education institutions. Drawing on existing literature and best practices, the study highlights the need for innovative and diversified funding mechanisms that reduce excessive dependence on government allocations. The study concludes that achieving sustainable financing for higher education innovation requires strong collaboration among government, public and private stakeholders and the wider society. It recommends the adoption of innovative funding strategies, improved financial accountability, and policy consistency to promote continuous institutional transformation, enhance competitiveness, and ensure the attainment of global best practices in higher education.

Keywords: *Higher Education, Sustainable Financing,Institutional Innovation,Financial Diversification, Resource Management,*

466. Four Decades of Land-Use/Land-Cover Transformation in Bayelsa State, Nigeria: Forest Decline, Woodland Expansion and Implications for AI-Enabled Environmental Management

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This study investigated over four decades of LULC dynamics in Bayelsa State, Nigeria, from 1980 to 2025, with a focus on forest decline, woodland expansion, and implications for AI-enabled environmental management. In ArcGIS 10.8, the multi-temporal Landsat images collected for six epochs (1980, 1990, 2000, 2010, 2020, and 2025) were subject to supervised classification using the Maximum Likelihood Classifier. Eight LULC classes: forest, woodland, grassland, mangrove, agricultural land, built-up areas, bare surfaces, and water bodies were identified. Change detection and transition matrix analysis were used to quantify the magnitudes and patterns of land-cover change over time. The results showed significant landscape change across the state. The area of forest cover decreased significantly from 3,955.30 km^2 (42.13%) in 1980 to 3,041.77 km^2 (32.40%) in 2025, indicating continuous deforestation. The area of woodland increased significantly from 1,159.87 km^2 (12.35%) to 2,012.89 km^2 (21.44%), indicating extensive secondary vegetation development. The built-up areas increased from 25.96 km 2 (0.28%) to 90.75 km 2 (0.97%), which shows the increasing importance of urbanization. The mangrove ecosystems were relatively stable, with slight increases from 41.22% to 41.98% of the total land area. The analysis of transitions showed intensive exchanges between forest and woodland, indicating a continuous ecological restructuring. The results demonstrate the significance of employing artificial intelligence, remote sensing, and geospatial analytics in environmental monitoring and decision-making. It is recommended that the deployment of AI-powered monitoring systems can improve early detection of changes in land cover, support sustainable land use planning, and bolster conservation efforts to maintain the ecological integrity of Bayelsa State in the long run.

Keywords: *Land-Use/Land-Cover Change, Forest Decline, Woodland Expansion, Artificial Intelligence, Remote Sensing, GIS, Environmental Management, Bayelsa State, Nigeria*

467. Geospatial Assessment of Nature -Based solutions to climate change in Imo State Nigeria

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Climate change poses significant environmental challenges in Imo State, Nigeria, including increased flooding, soil erosion, land degradation, biodiversity loss, and declining agricultural productivity. Nature-Based Solutions (NbS) have emerged as sustainable approaches for climate adaptation and mitigation through the protection, restoration, and management of ecosystems. This study assesses the spatial distribution, effectiveness, and potential of Nature-Based Solutions in Imo State using Geographic Information Systems (GIS) and Remote Sensing techniques. Multi-temporal satellite imagery, digital elevation models, land use/land cover datasets, climate records, and field observations are integrated to identify climate-vulnerable areas and existing ecosystem assets. Spatial analyses involving land-use change detection, vegetation health assessment using the Normalized Difference Vegetation Index (NDVI), erosion susceptibility mapping, flood-risk analysis, and ecosystem service evaluation are employed to determine areas suitable for NbS interventions. The assessment focuses on key NbS strategies including forest conservation, afforestation, watershed restoration, wetland protection, agroforestry, and urban green infrastructure. Previous studies indicate substantial land-use changes, vegetation loss, watershed degradation, and increasing erosion risks across parts of Imo State, highlighting the urgent need for ecosystem-based adaptation measures. The study is expected to generate spatially explicit maps identifying priority areas for NbS implementation and climate resilience planning. Findings will provide evidence-based support for policymakers, environmental managers, and development agencies in integrating geospatial technologies into climate adaptation strategies. The research contributes to sustainable environmental management by demonstrating how Nature-Based Solutions can simultaneously enhance ecosystem resilience, reduce climate risks, improve biodiversity conservation, and support sustainable livelihoods in Imo State.

Keywords: *Nature-Based Solutions, Climate Change Adaptation, GIS, Remote Sensing, Geospatial Assessment, Ecosystem Restoration, Climate Resilience, Imo State, Nigeria.*

468. Harnessing Digital Innovation for Improved Knowledge Ecosystems in Nigeria: Opportunities, Challenges and Framework for Sustainable Development

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Knowledge is the most strategic resource for national development, yet Nigeria's knowledge ecosystem remains fragmented, predominantly analogue, and inaccessible to the majority, particularly women and rural communities. Digital innovation can be leveraged to build an improved, inclusive and resilient knowledge ecosystem. Utilizing secondary data and current trends in education, agriculture and public administration, five strategic pillars of a digital knowledge ecosystem are identified viz digital content creation, cloud-based storage and repositories, open access platforms, digital literacy and capacity building, and inclusive governance. Evidence shows that digital tools such as mobile learning, open educational resources [OER], Geographic Information Systems [GIS], Artificial Intelligence, and community digital hubs can significantly increase knowledge access and reduce knowledge loss. However, challenges such as poor infrastructure, low digital literacy/competence, data costs, and weak policy implementation persist. A framework that prioritizes targeted investment, women-inclusive digital literacy, mandatory digital archiving, subsidized access and institutional policy reforms is recommended.

469. Harnessing Municipal Solid Waste for Electricity Generation and Sustainable Urban Infrastructure in Ikot Ekpene Metropolis, Akwa Ibom State, Nigeria

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The increasing generation of municipal solid waste (MSW) presents both an environmental challenge and an opportunity for sustainable infrastructure development in rapidly urbanising cities. This study evaluated the potential of MSW for electricity generation in Ikot Ekpene Metropolis, Akwa Ibom State, Nigeria, with emphasis on its application to sustainable urban and building infrastructure. A total of 100 kg of MSW was collected from ten selected locations and separated into eight waste components using spot sampling. The calorific values of organic waste, paper-carton, plastics, textile-leather-wood, glass, iron and metal packaging, inert materials and unknown waste were determined using a bomb calorimeter at 10% moisture content. A 1 kW prototype waste-to-energy plant was designed and constructed to model electricity generation. Forty-two combinations of two-component and three-component waste mixtures were evaluated at different mixing ratios. Linear programming was used to determine optimal calorific values, while Dulong's equations estimated electricity-generation potential. Analysis of variance was conducted at the 0.05 significance level. Findings indicated that the MSW studied, particularly organic, plastic and paper wastes, contained substantial calorific value suitable for energy recovery. The results showed the potential of waste-derived electricity to support sustainable urban infrastructure while reducing dependence on conventional energy sources and landfill disposal. The study recommends investment in appropriate waste-to-energy infrastructure, improved waste segregation, supportive policies and public awareness to promote resource recovery, cleaner energy production and environmentally sustainable infrastructure development.

Keywords: *Municipal solid waste, waste-to-energy, electricity generation, energy recovery, sustainable infrastructure, Nigeria*

470. Higher Education for Sustainable Development: Aligning Academic Instructions with the Global SDG Agenda

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Higher education institutions are becoming key players in achieving the Sustainable Development Goals (SDGs) through knowledge generation, human capital development, and sustainable development innovation. This study looks at how academic institutions, including universities, may integrate their research, teaching, community participation, and institutional governance with the SDG framework. Using the qualitative approach, the study identifies important pathways for alignment, such as curriculum integration, interdisciplinary research, sustainability-focused leadership, stakeholder partnerships, and campus operational reforms, based on an analysis of policy documents, academic literature, and emerging international practices. The analysis emphasizes that in order to achieve effective alignment, institution-wide policies that integrate SDG concepts into academic and administrative tasks are necessary, rather than relying solely on individual sustainability projects. In order to ensure that higher education remains relevant to global sustainability transitions, the paper concludes that aligning higher education with

the SDGs is not only an educational reform agenda but also a strategic investment in the future. This calls for coordinated action from governments, universities, business, and civil society.

471. Integrating Smart Technologies and Climate-Responsive Architecture in Nigerian Higher Education Institutions

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Nigerian tertiary education Institutions are at a critical crossroads. The choice is between remaining locked in traditional architectural designs and adopting smart, climate-responsive building approach to drive teaching, research, and sustainability. Currently, most campus architectural infrastructures are rarely designed with regional climate possibilities and smart technologies in mind. There is also a paucity of literature on the integration of smart technologies and climate reality in Nigerian higher education ecosystem. Available research dwells mostly outside the corridors of the education sector. Therefore, the call for transformation is urgently imperative, as the 21st century comes with attending consequences of climate change—one greatest threat to humans. Remedying climate change needs changing the methods in which these educational institutions are designed, constructed, managed, used, and maintained. This study is a call, urging governments and stakeholders in the higher education sector across Nigeria to take decisive steps towards prioritizing integrated smart buildings as a fundamental upgrade and institution-wide strategies for sustainable campus infrastructure. While adopting a qualitative research method with data analysis focusing on selected public tertiary schools in Nigeria, this paper calls for a push beyond piecemeal interventions and towards innovation-driven, sustainable, and resilient institutions capable of driving the UN's SDGs and the AU Agenda 2063. Preliminary findings reveal that smart architectural technologies optimize energy consumption, enhance occupant comfort, reduce construction waste, cut costs and save time. This research takes on Bio-climatic Architecture Theory while proposing a phased implementation framework, outlining needs in digital infrastructure and use.

472. Local Innovation, Indigenous Knowledge, and AI: Co-Designing Contextualized Technologies for Sustainable Development in Africa

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The discourse on artificial intelligence (AI) in Africa has been dominated by imported frameworks that often fail to address the continent's unique realities. This paper argues that sustainable AI advancement requires a fundamental reorientation towards local innovation ecosystems that integrate Indigenous Knowledge Systems (IKS) with AI through participatory co-design. Drawing on scholarship and three detailed case studies—the ITIKI drought early warning system in Kenya, co-design projects with Indigenous San communities in Namibia, and community-driven digital hubs across East Africa—we examine how participatory approaches bridge traditional and scientific knowledge systems. The ITIKI system demonstrates that integrating farmer knowledge with AI can achieve up to 98% forecast accuracy and 14% crop yield increases. The Namibian co-design projects reveal that culturally grounded AI interfaces foster trust and empower communities. Community-driven digital hubs show that inclusion requires locally owned, ethically grounded ecosystems. We introduce the "Wisdom Loop" as a conceptual framework that centers African epistemologies within AI design processes, emphasizing relational accountability, oral knowledge transmission, and collective sense-making. Drawing on Ubuntu philosophy and participatory ethics, the framework operationalizes five components: ancestral insight and community values, participatory co-design, ethical data collection, collective interpretation, and return of benefits to communities. We conclude that meaningful AI transformation in Africa must move beyond technology transfer and data extractivism to embrace culturally grounded, ethically accountable, and community-led innovation practices with significant implications for policymakers, developers, and researchers.

473. Nanoporous Carbon@cofe2o4 Nanocomposite as a Green Absorbent for Adsorptive Removal of Hg(Ii) from Aqueous Solution

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In order to handle the toxic pollutants associated with heavy metal and agriculture wastes, researchers have attempted to develop several adsorbent materials with change of shape, size, architecture, surface charges, and surface

biomolecules. Therefore, with a view of enhancing the efficiency of adsorbent materials, the present study deals with cobalt spinel ferrite (CoFe2O4) incorporated nanoporous carbon (NC) derived from palm kernel shell waste towards Hg(II) adsorption. The composite formed by the hydrothermal method was characterized thoroughly with FESEM, XRD, FTIR, pore sizes, and thermal analysis. Further, the Hg(II) adsorption studies were tested looking the effect variation of solution pH, dose, initial concentration, and contact time of adsorbent. Also, kinetic research (Freundlich model) exhibited finest adsorption isotherm having maximum Hg(II) sorption efficacy around 232.56 mg/g. Additionally, the thermodynamic studies based on ΔG, ΔH, and ΔS values confirmed the adsorption to be spontaneous, favorable, and endothermic reaction. Moreover, the adsorption effectiveness of the NC@CoFe2O4 nanocomposite was assessed using an actual sample of condensate from the oil and gas industry, demonstrating a remarkable 93% removal rate for Hg(II) ions in wastewater. Therefore, based on the results, the synthesized NC@CoFe2O4 nanocomposite can serve as a promising candidate for wastewater treatment considering its efficiency, inexpensive, and environmentally friendly source.

Keywords: *Nanoporous carbon; CoFe2O3; magnetite particles; Hg(II) adsorption; Thermodynamics; Wastewater treatment.*

474. Performance Evaluation of a Two-Chamber Microbial Fuel Cell for Sustainable Treatment of Rice Processing Wastewater

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Rice processing wastewater contains substantial biodegradable organic matter and requires appropriate treatment before discharge. This study evaluated a two-chamber microbial fuel cell (MFC) for simultaneous treatment of rice processing wastewater and bioelectricity generation. Rice wastewater collected from domestic processing activities in Mgbuoba, Port Harcourt, Nigeria, was characterized for chemical oxygen demand (COD), biochemical oxygen demand (BOD_5), turbidity, total suspended solids (TSS), total dissolved solids (TDS), pH and temperature. Microbial degradation was initially investigated using five batch digesters, and the Monod model yielded a maximum specific growth rate of 0.0668 day^{-1}, yield coefficient of 0.1339 and half-saturation constant of 26.077 mg/L. Because of low indigenous microbial activity, approximately 2 mL of cultured Aeromonas suspension was introduced into the anode chamber. The preliminary batch digestion was conducted for 35 days, while electrochemical performance was monitored separately for 5 days. COD and BOD_5 removal efficiencies of approximately 70% and 75%, respectively, were obtained. Electrical output increased until day 3, when maximum voltage, current, power and power density were approximately 0.11 V, 3.05 mA, 0.336 mW and 209.7 mW/m^2, respectively, before declining during days 4 and 5. The findings demonstrate the potential of rice wastewater as a substrate for simultaneous pollutant removal and low-level electricity generation. However, interpretation is limited by the single- run design and absence of abiotic and non-augmented controls.

Co-authors: *Chidi Wori; Tina Ishioma Francis-Akilaki*

Keywords: *Wastewater treatment, Microbial fuel cell; Pollutant's removal efficiency, Rice wastewater*

475. Physicochemical and Microbiological Assessment of Edible Clay:A Case Study of Minna,niger State,nigeria

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Edible clay is consumed in Nigeria for a variety of reasons including craving during pregnancy, medicinal reasons, cultural influences, or nutritional benefits. Studies have shown that edible clay contains certain concentration of heavy metals, essential minerals and microorganisms, however, it consumption can lead to certain health challenges. This study was aimed to investigate the microbiological and heavy metal content of edible clay sold in Minna town, Niger State of Nigeria.A total of five (5) lumps of edible clay were purchased from market women from four (4) different markets at two weeks interval. These samples were taken to the department of Microbiology research laboratory, IBB University, Lapai to determine pH, Moisture content, Sodium, Calcium, Magnesium, as well as heavy metals such as Lead, Cadmium, Chromium, Mercury and Arsenic. The samples were also analyzed for bacteria and fungi species. The result revealed that the pH values fall within an alkaline level ranging from 8.1-9.0.The samples also contain certain concentration of essential minerals like iron, calcium, magnesium and potassium. Lead concentration ranged from 0.0072mg/kg in Chanchaga market to 2.5001mg/kg in Gwari market, least concentration of cadmium (0.0001mg/kg) and the highest value (1.2010mg/kg) were both recorded in Gwari market Concentration of Chromium ranged

between 0.0011mg/kg to 1.2010mg/kg in Chanchaga market and Gwari market respectively. Lowest concentration of Mercury (0.0105mg/kg) was detected in Gwari market while Kure market had the highest value (2.0210mg/kg).Kure market recorded the lowest value of Arsenic (0.0001mg/kg) and Tunga market had the highest value (1.5720mg/kg).Statistical analysis using one-way ANOVA shows that there is no significant difference in the concentration of Arsenic (p>0.05;0.43),Mercury (p>0.05;0.12),Chromium (p>0.05;0.59) and Cadmium(p>0.05;0.29).However, the result revealed a significant difference in the concentration of lead (p<0.05;0.02).Samples from Gwari market had the highest load of bacteria and fungi, while Kure market recorded the lowest population of bacteria and lowest population of fungi was recorded in Chanchaga. Bacteria species isolated in the clay samples include Bacillus, Pseudomonas, Staphylococcus, and streptococcus species, while fungi isolates are Aspergillus, Candida, Mucor and Penicillium species. AnalysiEEs of the questionnaire revealed that sixty nine percent (69%) of the respondents eat edible clay; twenty percent (20%) do not consume it while eleven percent (11%) doesn't know it at all. Ninety one percent (91%) of those that eat edible clay are female; nine percent (9%) are male. Seventy percent of the female that eat edible clay are pregnant women. Seventy eight (78%) of the respondents are adults, while twenty two percent are adolescents. Eighty percent (80%) have different levels of education from primary to tertiary and twenty percent lack western education. Ninety eight percent (98%) of those involve in geophagia are ignorant of the health hazard associated with its consumption, while two percent (2%) are of the view that it may cause blockage of intestine

476. Readiness for Research Data Management among Academic Staff in Jigawa State Universities: Preparedness, Challenges, and Opportunities

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The increasing emphasis on open science, research transparency, and institutional accountability has positioned Research Data Management (RDM) as a critical component of contemporary scholarly communication. Effective RDM enhances the organization, preservation, sharing, and reuse of research data, thereby improving research quality, visibility, and impact. Despite its growing importance, the readiness of academic staff to adopt sound RDM practices remains uncertain in many Nigerian universities, particularly in emerging academic environments. This study examines the readiness for Research Data Management among academic staff in universities in Jigawa State, Nigeria, with particular emphasis on their level of preparedness, the challenges they encounter, and the opportunities available for strengthening RDM practices. Specifically, the study seeks to examine the level of preparedness of academic staff for research data management; identify the challenges affecting the management of research data; and explore opportunities for enhancing RDM practices within the universities. The study will adopt a descriptive survey research design, targeting academic staff across the selected universities in Jigawa State. Data will be collected using a structured questionnaire and analyzed using descriptive statistics. The findings are expected to provide empirical evidence on the current state of RDM readiness, reveal institutional, technological, and human capacity challenges, and identify opportunities such as policy development, capacity-building programmes, digital infrastructure improvement, and institutional support mechanisms. The study will contribute to the growing discourse on research data management in Nigerian higher education and provide practical recommendations for university administrators, librarians, policymakers, and research support units aimed at promoting effective research data management and advancing the principles of open science and research excellence.

Keywords: *Research Data Management; Research Data; Academic Staff; Readiness; Preparedness; Open Science; Universities; Jigawa State; Nigeria*

477. Repositioning Colleges of Education for Research and Innovation Grants: AI and Digital Technologies in Science Education for Out-of-School Children – A Case Study of Zamfara State College...

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The growing crisis of Out-of-School Children (OOSC) in Northern Nigeria, particularly in Zamfara State, demands innovative, scalable, and evidence-driven educational interventions. This review-based research article examines how Colleges of Education—specifically Zamfara State College of Education, Maru—can strategically reposition their research and innovation capacities to access competitive research grants focused on science teaching and learning

interventions for OOSC. The article critically synthesizes existing literature on grant-readiness frameworks, digital transformation in teacher education, and the integration of Artificial Intelligence (AI) and emerging digital technologies into non-formal basic science education. Findings from the review indicate that while the College possesses institutional potential and proximity to OOSC-affected communities, critical gaps exist in research infrastructure, grant proposal development skills, industry-academia linkages, and the mainstreaming of AI/digital pedagogies for marginalized learners. The article proposes a five-component repositioning model: (1) establishing a dedicated research and innovation grants office; (2) building workforce digital/AI competencies; (3) developing contextualized OOSC science content leveraging low-cost AI tools; (4) forming strategic partnerships with EdTech innovators and international donors; and (5) creating a living laboratory for OOSC science education research. Expected outcomes include increased grant acquisition success, improved science learning outcomes among OOSC, and the emergence of the College as a regional center of excellence. Recommendations are offered for college leadership, teacher educators, policymakers, and development partners.

478. Research and innovation in strengthening security for socioeconomic development in Nigeria

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This study examines the role of research and innovation in strengthening security for sustainable socioeconomic development in Nigeria. Security remains a fundamental pre-requisite for economic growth, political stability, social cohesion, and national development. However, Nigeria continues to face numerous security challenges, including terrorism, banditry, kidnapping cybercrime, communal conflicts and militancy, which have negatively affected investment, productivity, education and the overall quality of life of citizens the study argues that effective research and innovation approaches are essential for addressing the security threats and promoting sustainable development. The paper highlights the importance of evidence-based policy making, technological innovation, intelligence gathering, surveillance systems, artificial intelligence cybersecurity measures and community-based security strategies in combating insecurity. It further examines how collaboration among government agencies, academic institutions, research organizations, private sector actors and local communities can generate innovative solutions to contemporary security challenges. The study also explores the relationship between security and socio-economic development, emphazing that improved security enhances investment opportunities, employment generation, infrastructure development and social welfare. The research concludes that strengthening security research innovation is critical to achieving sustainable solid economic development in Nigeria. It recommends increased funding for security related research, adoption of modern security personnel, enhanced public private partnerships, and greater integration of local knowledge into security management frameworks. These measures will contribute significantly to national stability, economic prosperity and the overall wellbeing of Nigerians. Keywords. Research innovation security, socio-economic development.

479. Scenario-Based Learning as an Innovative Teaching Strategy: Effects on Students' Achievement and Retention in Colleges of Education

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This paper examined the effect of Scenario-Based Learning (SBL) as an innovative teaching strategy in enhancing students' academic achievement in Electrical Machines and Power in Colleges of Education in North-East Nigeria. Specifically, the paper determined the mean achievement scores of Students taught Electrical Machines and Power using SBL and those taught using lecture method, and the academic achievement of Male and Female students taught the course using SBL in Colleges of Education in North East, Nigeria. The paper was guided by two research question and two hypotheses. It was motivated by persistent decline in the academic performance of students in the course across the region, which have been linked to the continued use of conventional lecture methods by the course lecturers across the region. A quasi-experimental research design involving pre-test, post-test, was adopted. The population used comprised all NCE III Electrical Technology students within the Colleges of Education. The instrument for data collection was achievement instrument test developed by the researcher tagged: Electrical Machines and Power Achievement Test (EMPAT). The Instrument was validated by three experts and its reliability was obtained using PPMC in which 0.976 was obtained. The data collected were analyzed using mean and standard deviation and ANCOVA was used to test the hypotheses at 0.05 level of significant. The study revealed that students taught using SBL method

had a higher post-test mean scores compared to those taught using lecture method. It also revealed that the SBL was effective in enhancing students' achievement in Electrical Machines and Power for both genders, with no pronounced disparity between male and female students. The paper recommended among others that Lecturers of Electrical Machines and Power in Colleges of Education should adopt SBL method as instructional strategy in teaching.

480. Skills-Driven Education: Building Future Ecosystems for Nigeria

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The need to move beyond traditional rote learning to create localized, interconnected networks where working, living, and learning directly intersect is imperative for a better Africa. Most developed nations of the world are where they are today because they have moved beyond credentialing to prioritize competencies, work-integrated learning, and modular credentials. Mixed-methods research design was utilized for this study. Data were collected from 600 respondents comprising administrators of tertiary institutions, industry executives, technical instructors, and recent graduates across the six geopolitical zones of Nigeria. Quantitative evaluations using multiple linear regression and Pearson correlation analyses demonstrated a severe misalignment between institutional curriculum designs and contemporary market demands ($r = -0.58$, $p < .001$). Conversely, integrated Technical and Vocational Education and Training (TVET) models combined with Artificial Intelligence (AI) digital delivery frameworks accounted for 62.1% of the total variance in the Graduate Employability Index score ($R^2 = 0.621$, $F(3, 1196) = 326.4$, $p < .001$). Hence, qualitative insights exposed deep institutional resistance, infrastructural deficits, and pervasive social stigmas surrounding Technical and Vocational education. Recommendations that will help policymakers and institutions build a skill-focused, competitive and future-ready educational ecosystem in Nigeria, while safeguarding equity and access were given. The paper concludes that a paradigm shift of Nigeria's educational sector from a certificate-focused model to an integrated, skills-driven ecosystem will go a long way at transforming the rapidly growing youth population into a highly adaptable workforce.

Keywords: *Skills-Driven Education, Certificate-focused model, TVET, Outcome-Based Education, Youth Employability.*

481. Strategic Policy Mechanisms and Reversal of African Brain Drain through Diaspora Knowledge Transfer Systems

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The persistent outflow of highly skilled human capital, traditionally framed as "brain drain," remains a critical impediment to building robust public policy and research ecosystems across Africa. However, the contemporary digital age offers unprecedented opportunities to recalibrate this challenge. This paper examines how African states can deploy strategic public policy mechanisms to transform brain drain into "brain gain" by institutionalising diaspora knowledge transfer systems. Theoretically, this study anchors its analysis in the Network Mobility Approach and Institutional Theory. The Network Mobility Approach shifts the paradigm from permanent physical return to virtual, circular brain circulation, viewing the diaspora as a transnational network asset. Institutional Theory complements this by evaluating how state-led regulatory frameworks, intellectual property regimes, and digital infrastructure either constrain or enable effective knowledge repatriation. Methodologically, this research adopts a qualitative, comparative case study design, focusing on the diaspora engagement policies of Nigeria, Kenya, and Ghana. Utilizing secondary data from policy documents, continental frameworks (such as the African Union's Agenda 2063), and existing institutional reports, the study employs thematic analysis to evaluate the efficacy of current state strategies. Preliminary insights reveal that while structural bottlenecks—such as weak institutional trust and fragmented intellectual property protections—hinder collaboration, targeted policies like digital diaspora registries, sovereign research grants, and bilateral institutional partnerships significantly optimize knowledge ecosystems. Ultimately, the paper provides a strategic roadmap for policymakers, demonstrating how international relations and domestic public policy can converge to leverage transnational networks, thereby fostering sustainable innovation and strategic autonomy on the continent.

482. Strengthening Research and Innovation in Agricultural Education as a Strategy for Enhancing Access to Credit Facilities by Farmers in Taraba State, North East Nigeria

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This study examines the role of strengthening research and innovation in Agricultural Education as a strategy for enhancing farmers' access to credit in Taraba State. Specifically, it assess how innovative research, digital agricultural literacy, and institutional collaboration can bridge the information and trust gaps between farmers, Colleges of Education, extension services, and lending institutions such as Banks and Anchor Borrowers'. A descriptive survey design was adopted. Data were collected from 150 farmers, 35 agricultural educators, and 15 credit officers across the three agricultural zones of Taraba State, using structured questionnaires, focus group discussions, and key informant interviews. Data were analyzed using descriptive statistics and regression analysis.The findings revealed that, low financial literacy and poor record-keeping among farmers significantly limit loan approval rates, Agricultural Education institutions in Taraba State have minimal capacity to conduct demand-driven research that addresses credit-related challenges, innovation in Agricultural Education, such as farm data management, agri-business training, and digital platforms like TERAS, can improve farmers' bankability and loan repayment capacity. The study further showed a significant positive relationship between research-driven agricultural education and farmers' successful access to credit ($r = 0.72$, $p < 0.05$).The study concludes that strengthening research and innovation in Agricultural Education is vital for producing graduates and extension agents who can train farmers on credit readiness and business planning. It recommends that , curriculum review in Colleges of Education to include agri-finance and entrepreneurship, establishment of Agricultural Innovation and Credit Linkage Hubs in institutions like Taraba State College of Education, Zing, stronger partnerships between TETFund, financial institutions, and farming cooperatives, deployment of digital tools for farm record keeping and loan tracking.It is expected that implementing these strategies will improve financial inclusion, boost agricultural productivity and contribute to food Security.

Keywords: *Agricultural Education, Research, Innovation, Credit Facilities, Farmers, Strategy, Financial Inclusion*

483. Strengthening Research, Innovation and Collaboration for Societal and Economic Impact

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The study seeks to determine how research, innovation and collaboration can be strengthened for societal and economic impact. Two research questions with two corresponding null hypotheses guide the study. The study adopts a survey design. The target population is 234 respondents comprising 39 lecturers from Fr Moses Orshio Adasu University, Makurdi, 39 lecturers from Joseph Sarwuan Tarka University, Makurdi, 39 lecturers from College of Education, Oju, and 39 lecturers from College of Education, Katsina-Ala. A structured questionnaire titled Research, Innovation and Collaboration Questionnaire (RICQ) will be used for data collection, and the instrument will be face validated by three independent experts from different universities. The data collected will be analysed using mean and standard deviation for the research questions, while the null hypotheses will be tested using Analysis of Covariance (ANCOVA) at the 0.05 level of significance. The instrument will be pilot tested at Nasarawa State higher institutions of learning and the reliability index established using Cronbach's Alpha, with the findings of the study reported accordingly.

Keywords: *Research, innovation, collaboration, societal impact, economic impact*

484. Strengthening Research, Innovation, and Knowledge Ecosystems for Societal and Economic Impact: Evidence from Tertiary Institutions in Zamfara State, Nigeria

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Research and innovation are widely recognized as critical drivers of societal progress, economic growth, and sustainable development. Tertiary institutions play a vital role in generating knowledge, fostering innovation, and facilitating collaborations that address contemporary societal challenges. However, many institutions in developing countries continue to face constraints related to research capacity, innovation support systems, funding, and collaborative networks. This study examines the status of research, innovation, and knowledge ecosystems in selected tertiary institutions in Zamfara State, Nigeria, with the aim of identifying opportunities for enhancing societal and economic impact. A mixed-methods research design will be adopted, integrating quantitative and qualitative approaches. The study population comprises approximately 1,400 academic staff from selected tertiary institutions in the state. Using the Taro Yamane sample size determination formula at a 5% margin of error, a sample size of 311 respondents was obtained and proportionately distributed across the selected institutions. Data will be collected

through structured questionnaires, interviews, and direct observations, and be analyzed using descriptive and inferential statistics as well as thematic analysis. The study anticipates increasing participation in research and innovation activities and growing collaboration among institutions and external stakeholders. It recommended for enhanced research funding, innovation hubs, strategic partnerships, capacity-building initiatives, and policies that promote knowledge transfer and utilization to maximize societal and economic impact.

485. The Ethics of Research Funding and Academic Freedom in Nigerian Tertiary Institutions: Philosophical Perspectives on Strengthening Nigeria's Knowledge Ecosystem

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An examination of the philosophical and ethical dimensions of research funding and their implication for academic freedom in Nigerian tertiary institutions: This article critically analyzes the philosophical questions, ethical problems of funding academic research, and their attendant implication on academic freedom in the context of Nigerian tertiary institutions. With growing reliance on support from donor organizations, governments and industries to finance academic research initiatives, tertiary institutions across Nigeria raise certain significant issues: how does the interest and objective of external sources of research funding constrain, modify or shape academic research undertakings? A study from an epistemological theoretical of research ethics and epistemic autonomy (the ability to know and gain knowledge free from coercive social power) and power-money relation in knowledge generation shows that the pressure by funders on Nigerian tertiary institutions research outcome and relevance does not synchronize with core values of quest for knowledge and the independence of knowledge creation in tertiary institutions. If tertiary institutions remain at dependence to external funding sources on due course of academic activity can lead an epistemic capture such that choice for selection research and academic topics depend on how that topic can secure funding and not what is academically or scientifically relevant or valuable, thus making the marginalized fields unable to receive any support. To mitigate this, this article provides an epistemic guide towards the funding of academic research which emphasize transparency and the diversity of the nature of knowledge that ought to be created, and fairness in the distribution and dissemination of knowledge so as to safeguard academic freedom and encourage an enduring academic-public-private relationship.

Keywords: *research funding, academic freedom, Nigeria, higher education ethics, epistemic justice*

486. The Role of Intermediary Organizations in Bridging Research and Market Gaps within Regional Knowledge Ecosystems: A Focus on the Nigerian Educational Sector

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This paper examines how intermediary organizations bridge research-market gaps within Nigeria's educational sector, where knowledge production and commercialization remain severely disconnected despite substantial research output. Drawing on evidence from government documents, agency reports, and scholarly literature (2023–2026), we identify three intermediary models: NOTAP's intellectual property and technology transfer offices (69 established), NASENI's public agency commercialization framework (44 indigenous technologies commercialized), and TETFund-sponsored multi-stakeholder initiatives (15 memoranda of understanding signed). Despite these investments, systemic challenges persist—weak intellectual property cultures, inadequate research infrastructure, fragmented coordination, and commercialization rates below one percent (compared to regional benchmarks of five to ten percent). We propose an integrated framework for effective intermediation tailored to Nigeria, including complementary intermediation portfolios, structured commercialization pathways, and sustainable financing models that diversify beyond government dependence. Priority areas for future research and policy intervention are identified.

Keywords: *innovation intermediaries, technology transfer, university-industry linkage, knowledge ecosystems, Nigeria, research commercialization*

487. Towards an African Digital Higher Education Ecosystem Model: Theoretical Perspectives on Innovation, Inclusion and Resilience

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African higher education faces structural fragmentation, chronic resource scarcity, unequal access, and uneven digital readiness. COVID-19 exposed these faults and accelerated digital learning adoption, but responses remain fragmented—scattered institutional pilots, donor-driven projects, and imported platforms often misaligned with local socio-technical realities. A unified, theory-driven ecosystem model is therefore needed to guide sustainable digital transformation that promotes innovation, equity, and systemic resilience. This study introduces the African Digital Higher Education Ecosystem (ADHEE) framework, integrating multi-level drivers, actors, and interactions to address three questions: which theoretical lenses clarify digital transformation in African universities; what design principles enable innovation, inclusion, and resilience; and how can policy and institutional mechanisms align to scale context-sensitive digital practices. ADHEE synthesizes socio-technical systems theory (co-evolution of technology, institutions, practices), institutional theory (isomorphism and entrepreneurial norm change), and capability and digital justice approaches (learner and educator agency, equitable opportunity). Five interdependent domains guide action: infrastructure commons (shared connectivity, energy), human capital (pedagogy, local content), governance fabric (policy, financing alignment), innovation flows (research linkages, open resources), and inclusion mechanisms (cultural relevance, marginalized groups' support). Core propositions emphasize layered redundancies for resilience, local entrepreneurship with sustainable financing to reduce donor dependence, and pedagogical shifts for meaningful inclusion. Policy recommendations include interoperable open standards, national digital public goods, accreditation reform for blended pathways, dedicated accountable funds, and inclusion metrics. Future research should use mixed methods, comparative cases, and iterative design-based studies to validate outcomes such as equity of access, learning gains, employability, entrepreneurialability and shock resilience.

Keywords: *African Digital Higher Education, Education Ecosystem Model, Innovation, Inclusion, Resilience.*

488. Transcending the White Board: Architecting the AI-Augmented Classroom; Prospects and Challenges in Selected North-Eastern Nigerian Colleges of Education

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As digital innovations brings about rapid transformations on higher education across the world, integrating Artificial Intelligence (AI) offers unparalleled opportunities to redesign teacher training. This paper examines the prospects and challenges of architecting AI-Integrated classrooms in some Colleges of Education in North-Estern Nigeria. This part of Nigerian traverses a distinct infrastructural and socio-economic dynamics. Deploying a mixed-methods research design, this study examines institutional readiness, technological infrastructure and educator digital literacy. The findings reveal fundamental prospects, comprising AI-driven personalized learning, automated administration, adaptive pedagogies capable of bridging educational gaps. Nevertheless, these opportunities are hindered by some precarious challenges particularly irregular power supply, poor internet connectivity, high costs of technology and traditional educational inertia. Eventually, this paper demonstrates that transcending "beyond the white board" necessitates targeted policy frameworks, EdTech collaborations, and strong capacity building initiatives. Thus, the paper concludes by offering a strategic blueprint for stakeholders to sustainably implement scalable, AI-inclusive educational ecosystem aligned with Africa's broader developmental goals.

Keywords: *Artificial Intelligence, Digital Pedagogy, College of Education, North-Eastern Nigeria*

489. University-Industry Linkages and Entrepreneurship Development among Students in Tertiary Institutions in Calabar Education Zone of Cross River State, Nigeria

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This study examined university-industry linkages and entrepreneurship development among students in tertiary institutions in Calabar Education Zone of Cross River State, Nigeria. Three objectives guided the study: to examine the influence of research collaboration linkages on entrepreneurship development, to assess the influence of industrial training and internship linkages on entrepreneurship development, and to determine the influence of technology transfer linkages on entrepreneurship development among students in tertiary institutions in Calabar Education Zone of Cross River State. The study adopted a survey research design. The population comprised students, academic staff, entrepreneurship centre coordinators, industrial training officers, and administrators in selected tertiary institutions within Calabar Education Zone. The sample size for the study was determined using the Taro Yamane sample size determination method, while an appropriate sampling technique was used to select respondents from the selected

tertiary institutions. Data were collected using a structured questionnaire titled “University-Industry Linkages and Entrepreneurship Development Questionnaire (UILEDQ).” Experts in entrepreneurship education, educational management, and measurement and evaluation validated the instrument. Reliability was established using the Cronbach Alpha method. The data collected were analyzed using mean and standard deviation. The findings revealed that research collaboration linkages, industrial training and internship linkages, and technology transfer linkages positively influenced entrepreneurship development among students. The study concluded that effective collaboration between tertiary institutions and industries enhances students’ entrepreneurial knowledge, practical skills, innovation capacity, business awareness, and readiness for self-employment. The study recommended that tertiary institutions should strengthen research partnerships with industries, improve industrial training and internship opportunities, and promote technology transfer programmes that expose students to innovation, enterprise creation, and practical business development.

490. Workforce Migration, Ethnic Diversity, and Organizational Sustainability in Nigeria’s Changing Economy

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Nigeria functions simultaneously as a major source, transit, and destination country for migrant workers within West Africa and beyond. This paper investigates how workforce migration and ethnic diversity shape organizational sustainability in Nigeria’s public and private sectors. Focusing on universities, banks, NGOs, and technology firms, it examines how internal migration (rural–urban, inter state) and cross border migration within ECOWAS and beyond are reconfiguring workplace demographics, power relations, and institutional cultures.

The study aims to examine how workforce migration and ethnic diversity influence organizational sustainability in Nigeria’s public and private sectors. Specifically, the study seeks to explore how ethnic dynamics and internal/external migration patterns influence recruitment, promotion, and leadership trajectories in Nigerian organizations, assess how ethnic diversity and talent mobility contribute to, or undermine, organizational resilience, innovation, and long term sustainability; and identify inclusive policies and practices that can enable Nigerian institutions to manage ethnically diverse workforces amid political volatility, economic uncertainty, and terrorism induced displacement. Drawing on policy documents, secondary empirical studies, and illustrative case material from selected Nigerian organizations, the paper situates Nigeria’s experience within broader international debates on migration governance, diversity management, and sustainable organizational development. It argues that Nigerian institutions provide critical insights into how organizations in the Global South negotiate complex ethnic dynamics under conditions of intensified mobility and insecurity. The paper concludes by outlining policy and practice recommendations for fostering organizations that are efficient and competitive while also being ethnically inclusive, socially cohesive, and better equipped to navigate a world in flux.

Sustainability and the Future

36 abstracts

Digital innovation for sustainable development, resilience and the future of higher education.

491. Aligning Entrepreneurship Business Education with Sustainable Development Goals: a Framework for Sustainable Skills Development and Graduate Employability in South-West Universities in...

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This study investigated the alignment of Entrepreneurship Business Education with the Sustainable Development Goals (SDGs) as a framework for promoting sustainable skills development and enhancing graduate employability in South-West universities in Nigeria. Three research questions and three hypotheses guided the study. A descriptive survey research design was adopted with the population comprising all the final-year Business Education students and 143 Entrepreneurship and Business Education lecturers in public universities across South-West Nigeria. A sample of 512 respondents was selected using a multi-stage sampling technique. Data were collected using a structured questionnaire titled Entrepreneurship Business Education, Sustainable Skills Development and Graduate Employability Questionnaire (EBESSDGEQ). The instrument was validated by experts in Business Education and Educational Measurement from the Adeyemi Federal University of Education, Ondo; while a reliability coefficient of 0.87 was obtained using Cronbach Alpha. Data were analyzed using mean and standard deviation to answer the research questions, while multiple regression analysis and t-test statistics were employed to test the hypotheses at the 0.05 level of significance. The findings from the study revealed that the integration of SDG-related content into Entrepreneurship Business Education significantly influenced the development of sustainable entrepreneurial skills among students. Also, it was found that, sustainable skills development had a significant positive effect on graduate employability. The result also revealed a significant relationship between entrepreneurship curriculum alignment with SDGs and graduates' readiness for self-employment and labour market participation in South-West universities in Nigeria. The study therefore recommended that, universities should mainstream SDG principles into Entrepreneurship Business Education curricula, strengthen industry-academia partnerships for experiential learning, and provide continuous capacity-building programmes for lecturers to effectively deliver sustainability-focused entrepreneurship education which would contribute significantly to sustainable economic growth, job creation, and the achievement of national development objectives.

Keywords: *Entrepreneurship Business Education, Sustainable Development Goals, Sustainable Skills Development, Graduate Employability, South-West Nigeria.*

492. Aligning Higher Education Practices with Sustainable Development Goals in Public and Private University in Anambra State, Nigeria

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Higher education institutions are vital catalysts for societal transformation, yet the pathways to embedding global sustainability into local university ecosystems remain uneven and deeply complex. This study investigates the Alignment of Higher Education Practices with Sustainable Development Goals in Public and Private Universities in Anambra State, Nigeria. The research is driven by two specific objectives: To evaluate the extent to which sustainable development goals have been integrated into academic curricula and institutional practices, and, to examine the relationship between students' participation in sustainability-focused courses and their engagement in campus green initiatives. Data were gathered through questionnaire and semi-structured interviews. Pearson Product Moment Correlation was used to analyze the data generated. The study found that a significant positive relationship exists between the integration of Sustainable Development Goals (SDGs) into academic curricula and their implementation in institutional practices, and that students' participation in sustainability-focused courses is positively related to their involvement in campus green initiatives. The study concluded that integration of the Sustainable Development Goals (SDGs) into higher education curricula is an important step towards preparing students and institutions to respond effectively to social, economic and environmental challenges of the present and future. That students' participation in sustainability-focused courses is related to their engagement in campus green initiatives. The study recommended that: Universities should give greater attention to sustainability-related issues in their academic curricula, Lecturers

should be encouraged to connect sustainability concepts with real-life situations and use practical examples, discussions, projects and assignments that enable students to understand how sustainable development relates to their everyday lives. Finally, that University management should create more opportunities for students to participate in practical green initiatives such as recycling programmes, tree planting, waste reduction campaigns, and linked to relevant courses in order to cultivate a university culture where sustainable development is not merely taught, but actively lived.

493. Aligning higher education with sustainable development goals in Nigeria:The Roles of Agricultural Education

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sustainable development goals provides a global framework for addressing pressing challenges such as poverty, hunger, climate change, environmental degradation and inequality. Higher educational institutions play a critical role in attaining these goals through effective and learning, research, innovations and community engagements. Agricultural education as a specialized field of study within higher education system, contributes immensely/ significantly to sustainable development by equipping learners with knowledge, skills and competencies necessary for sustainable food production, environmental conservation, and rural development. The paper examines the role of agricultural education to food security, hunger, climate resilience, environmental sustainability and employment generation. The paper further explores the challenges impeding the effective integration of SDGs into agricultural education and suggests strategies for strengthening the contributions of higher education institutions to sustainable development. The paper concludes that agricultural education is a strategic instrument for achieving the sdgs and recommends a comprehensive curriculum review/reforms, increased funding, technological integration and stronger critical stakeholders partnerships to enhance its impact.

Keywords: *Agricultural Education, Higher Education, Sustainable De*

494. Aligning Islamic Higher Education with the Sustainable Development Goals: The Role of Maqāṣid al-Sharīʿah in Curriculum Innovation and Sustainable Human Development in Africa

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The Sustainable Development Goals (SDGs) have become a global framework for promoting inclusive, equitable, and sustainable development, with higher education recognized as a strategic driver for achieving these objectives. In Africa, however, many institutions of higher learning, including Islamic higher education institutions, continue to face challenges related to curriculum relevance, graduate employability, ethical leadership, and sustainable human development. This paper examines the role of Maqāṣid al-Sharīʿah (the higher objectives of Islamic law) as a conceptual and ethical framework for aligning Islamic higher education with the SDGs through curriculum innovation and human capital development. Anchored on the five essential objectives of the Sharīʿah—protection of religion (ḥifẓ al-dīn), life (ḥifẓ al-nafs), intellect (ḥifẓ al-ʿaql), progeny (ḥifẓ al-nasl), and wealth (ḥifẓ al-māl)—the study argues that Islamic educational philosophy provides a holistic approach that complements the aspirations of the SDGs, particularly those relating to quality education (SDG 4), decent work and economic growth (SDG 8), reduced inequalities (SDG 10), peace, justice and strong institutions (SDG 16), and partnerships for sustainable development (SDG 17). Employing a qualitative research design based on documentary analysis of the Qur'an, Sunnah, classical and contemporary literature on Maqāṣid al-Sharīʿah, and policy documents on the SDGs, the paper analyses the extent to which Islamic higher education curricula can be restructured to integrate sustainability, digital literacy, entrepreneurship, research and innovation, environmental stewardship, and ethical leadership without compromising Islamic values. The paper further highlights the opportunities and challenges facing Islamic higher education institutions in Africa and proposes a Maqāṣid-oriented curriculum model that promotes intellectual excellence, moral responsibility, social inclusion, and sustainable human development. It concludes that aligning Islamic higher education with the SDGs through the framework of Maqāṣid al-Sharīʿah not only strengthens the relevance of Islamic education in addressing contemporary developmental challenges but also contributes significantly to the realization of Africa's sustainable development agenda. K

495. Analysis of Social Studies Education in Promoting Discipline and Religious Tolerance among Youths in Nigeria. a Pancea for Sustainable Development Goals

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Indiscipline and Religious intolerance that manifested in the young generation of this country pose a big threat on national unity and cohesion. Religion which is intended to be a catalyst of promoting peace in the society is now used to shatter the peaceful coexistence of a heterogeneous Nigeria. Social studies education inculcates in students the knowledge, skills, attitudes and actions that are considered important in the relationship and interaction of man and those around him on one hand, and the entire environment. This paper examines the role of social studies education as it relates to mitigating acts of indiscipline as well as curving religious bigotry that remains a bottleneck in the development of Nigerian society. One of the major findings of this paper indicates that attitudes and beliefs as well as emotions that triggers conflict and intolerance are all learned human behaviors and can be modified through the effective teaching and learning of social studies. Furthermore, the paper outlined some recommendations that would enhance religious tolerance among students through social studies education. Such suggestions include: curriculum reform, teacher training, community engagement as well as policy support.

496. Application of Quantile Regression Analysis on Financial Sustainability and Innovation in Higher Education in Nigeria

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Higher education institutions globally while driving innovation face high pressure in order to achieve financial sustainability amid decline in government funding. However, studies using Ordinary Least Squares regression, have shown uniform effects of funding and innovation strategies across all institutions. This study used quantile regression to examines the financial and sustainable model for higher education innovation in order to capture differential effects across the performance distribution of Nigerian universities from 2014 to 2024. Specifically, the study investigates how funding diversity, cost efficiency, and innovation adoption influence financial sustainability at the 10th, 25th, 50th, 75th, and 90th quantiles. the source of data is from NUC statistical digests and audited financial statements of 60 federal, state, and private universities. The findings show significant asymmetry in the determinants of financial sustainability. Government grants and TETFund allocations exert strong positive effects at lower quantiles Q10–Q25, but become statistically insignificant for top-tier institutions at Q90. This implies that, internally generated revenue and cost efficiency ratios are the major determinants of sustainability for high-performing universities. Innovation adoption indicates a U-shaped effect, significantly enhancing sustainability only for institutions at the median and upper quantiles. The study therefor suggests that a one-fits-all funding policy is effective for Nigerian higher Institutions.

497. Artificial Intelligence for Educational Sustainability in an Inclusive School System:

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Artificial intelligence (AI) focuses on developing computers capable of human-like cognitive activities, profoundly impacting education and global sustainability trends. This has significant impacts on both education and global sustainability. In education, AI offers the potential to improve access, equity, and quality, while also preparing students for the future workforce. To explore this connection, a clear research plan was developed. This plan investigates how integrating AI into Inclusive education contributes to achieving Sustainable Development Goal 4 (SDG 4). The methodology relied on a comprehensive literature review using peer reviewed journal articles and conference proceedings from the Scopus database, Focusing on publications between 2010 and 2023. Boolean algebra was used as a search query with keywords such as "Artificial Intelligence," "educational sustainability," "South Africa," and "school system." The result from Scopus displayed 22 documents found. Analysed data was presented using descriptive statistics. The results revealed that the research is limited to higher learning of institutions, leaving out teachers at the school level. Despite AI's potential to advance the United Nations' Sustainable Development Goals, especially Goal 4, which emphasizes inclusive and quality education, disparities persists. The study concludes by emphasizing the pertinent of involving teachers in AI tool implementation to truly enhance educational sustainability, addressing

existing gaps in the educational landscape.

Keywords: *Artificial intelligent (AI); inclusive education; sustainability; school system*

498. Assessment of The Presidential Youth's Empowerment Programme in Improving Beneficiaries' Agricultural Livelihood Activities in Bayelsa State, Nigeria

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The study assessed the Presidential Youth Empowerment Programme (PYEP) in improving beneficiaries' agricultural livelihood activities in Bayelsa State, Nigeria. The study specifically examined the types of skills and business opportunities provided, skills acquired by beneficiaries, eligibility criteria, access to programme funding, and the livelihood activities of beneficiaries. Primary data were collected using structured questionnaires administered to 177 P-YEP beneficiaries selected through a multistage sampling procedure across Yenagoa, Brass, and Sagbama Local Government Areas. Descriptive statistics and Analysis of Variance (ANOVA) were employed for data analysis. Findings revealed that PYEP mainly provided skills in aquaculture (39.0%), arable crop production (26.0%), livestock (25.4%), and ICT (9.6%). Livestock (41.8%) and fish farming (20.3%) were the most acquired skills among beneficiaries. However, skill proficiency was generally low, with 65.0% of respondents reporting low proficiency and only 1.1% reporting high proficiency. Although 70.1% of beneficiaries were aware of funding opportunities, 27.7% had not received any funding, and most beneficiaries (42.4%) received ₦50,000 or less, resulting in a low mean funding amount of ₦71,640.63 (SD = ₦62,762.11). Access to funds was perceived as difficult by a majority, with 36.2% rating it as very difficult. Livelihood outcome analysis showed a grand mean of 2.82, which fell below the decision cut-off of 3.00, indicating weak overall livelihood improvement. While fish farming (mean = 3.61), rice farming (3.21), yam farming (3.38), and sweet potato farming (3.20) showed moderate engagement, most other activities recorded low participation. ANOVA results indicated that skill type did not significantly influence livelihood outcomes ($F = 1.200$, $p = 0.313$). The study concludes that PYEP has limited impact on sustainable agricultural livelihoods and financial support to enhance effectiveness.

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Keywords: *Agricultural, Bayelsa, Empowerment, livelihoods, Presidential, Youth*

499. BandirtBanditry and the Future of Girl-Child Education in Northwest Nigeria (2020-2025)

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Banditry in Northwest Nigeria has evolved from a localised form of rural violence into a serious humanitarian crisis, threatening the socio-economic well-being of the population. The education sector, particularly public secondary and primary schools, has suffered the most severe structural shocks from this menace, including the displacement of rural communities, the conversion of schools into hideouts by bandits, the destruction of school infrastructure, and, worst of all, the kidnapping of children and teachers in schools. This has led to the closure of schools, the withdrawal of children from schools, a decline in school enrolment and attendance among both teachers and students, psychological trauma, the disruption of academic activities, and, above all, a decline in literacy levels in the region. Therefore, this paper sought to examine the impact of banditry on the future of girl-child education across the worst-affected states in the North-Western region of Katsina, Kaduna, Kebbi, Sokoto, and Zamfara—between 2020 and 2025. Adopting the Human Security Theory and a mixed-methods research design, the study collected data from primary and secondary sources. The findings from the study reveal that the targeted kidnapping of schoolgirls and teachers, displacement, and the closure of schools by the state governments have caused an unprecedented increase in the number of out-of-school female children, which has led to exploitative domestic labour, sexual violence, illiteracy and the vicious circle of reproducing children with no educational future in the region.

500. Climate Variability, Resource Dynamics and Conflict Pathways in the Lake Chad Basin: A Review of Hydrological Change, Livelihood Stress and Regional Insecurity

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The Lake Chad Basin (LCB) is a fragile socio-ecological region where climate variability, environmental degradation, and insecurity interact in complex and reinforcing ways. This study systematically reviews empirical literature on the relationships between hydro-climatic variability, resource dynamics, and conflict pathways within the basin. Drawing from peer-reviewed articles, institutional reports, hydrological assessments, remote sensing studies, and socio-economic research, the paper synthesizes evidence on how environmental change affects livelihoods and contributes to insecurity. Findings indicate that the basin has experienced significant hydro-climatic variability characterized by irregular rainfall, prolonged droughts, flooding, and persistent lake shrinkage. These changes have reduced the availability and reliability of essential natural resources such as water, grazing land, and arable farmland. As a result, competition among resource-dependent communities, especially farmers and pastoralists, has intensified. The review further reveals that environmental stress interacts with poverty, population growth, weak governance, and socio-economic vulnerabilities to heighten insecurity, including insurgency-related violence. Although communities have adopted coping strategies such as migration, livelihood diversification, and informal conflict resolution, these measures are increasingly constrained by demographic and institutional pressures. The study concludes that climate variability primarily acts as a risk multiplier, exacerbating existing structural vulnerabilities and conflict dynamics in the Lake Chad Basin.

Keywords: *climate; variability; Lake Chad Basin; conflict; insecurity.*

501. Digital Skills Gap and Security Studies: Advancing Professional Readiness and Sustainable Development Through University Education in Nigeria

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There is widening digital skills gap in Nigerian universities. This poses significant challenges to the preparation of security studies graduates for prospective technology-driven security environment. In the review of previous studies, it has been observed that paucity of investments in digital knowledge and lack of adequate technical skills impede graduate employability, institutional effectiveness and the challenges experienced in national security outcomes. This study examined how strengthening digital competencies can enhance professional readiness and contribute to sustainable development in Nigeria. The study is anchored on the Human Capital Theory. It adopted qualitative research design. It relied on documentary analysis of policy documents, university curricula, government reports and relevant scholarly literature to assess the possibility of integrating digital competencies into security studies programmes. The findings suggest that curriculum innovation, digital infrastructure, faculty capacity building, and strategic partnerships with security agencies and technology firms would help bridge the digital skills gap. The study concluded that if digital technologies are embedded in security studies education, they would strengthen workforce preparedness, promote innovation and support Nigeria's pursuit of sustainable development in this digital age.

502. Digital Soil Health Monitoring and Artificial Intelligence for Climate-Smart Agriculture; Opportunities for University Research and Sustainable Development in Nigeria

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Nigeria’s agricultural system faces crisis of soil degradation, climate stress, and low smallholder productivity. Years of nutrient depletion, erosion, and climate-related shocks have left a significant portion of farmland exhausted, while climate-smart agriculture (CSA) adoption remains constrained by weak advisory systems, limited finance, and fragmented policy. Digital soil health monitoring (DSHM)—combining in-situ sensors, remote sensing, laboratory analysis, digital soil mapping, and artificial intelligence (AI)—offers a potentially transformative pathway for CSA. In Nigeria, DSHM and AI research remains fragmented, pilot-scale, and weakly connected to university research, extension systems, and national soil information infrastructure. This study develops an integrated DSHM–AI–CSA nexus framework and examines opportunities for Nigerian universities to advance research, innovation, and sustainable development. This study observed that: (i) Nigeria has significant policy momentum through the Nigerian Farmers’ Soil Health Scheme, the Nigeria Soil Information System, the National Agricultural Land and Soil Management Policy, and the National Artificial Intelligence Strategy; (ii) AI methods such as random forests, artificial neural networks, and digital advisory tools have demonstrated measurable potential, including rice yield gains of approximately 1,907 kg/ha from mobile advisory services; and (iii) scale-up is constrained by data scarcity, sensor calibration gaps, rural connectivity, digital literacy, weak governance, and underfunded research capacity. Universities

can serve as neutral data stewards, co-developers of locally calibrated and explainable models, operators of soil-health living laboratories, and boundary organizations linking NISIS, extension services, farmers, and industry. This paper recommends universities to key into research and policy actions to align DSHM–AI innovation with CSA, for Sustainable Development Goals, and Nigeria's climate commitments.

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Keywords: *Digital Soil Health; Artificial Intelligence; Climate-Smart Agriculture; Nigeria; University Research; Sustainable development*

503. Effect of Linguistic Relativism and Ethnocentrism in Sustaining the Future of a Political Majoritarian Society

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Effect of Linguistic Relativism and Ethnocentrism in sustaining the future of a Political Majoritarian society. This paper focuses on how linguistic situation of cultural relativism and ethnocentrism threatens the survival of the minority languages in multicultural environment that majority languages dominate national interest. The minority communities in their own rights need participation in the economy and political life of the society they belong. Many literatures and documentary evidences affirm that crisis and tension in most communities results from lack of protection of the rights of the minority groups. The trend towards homogeneity of global cultures simulated many minority groups to search for their native roots and hold tighter to their cultural identity. This situation requires the application of Artificial Intelligence in rights of the minority languages for reimagining conflict free political future. The findings revealed that essential component of good governance; efforts to prevent tension, conflict and the construction of equal political and social life create a stable human society. The study recommends the application of AI for creation of unity in diversity to accommodate rights of linguistic groups participation in governance.

Keywords: *Artificial Intelligence. Sustainability, Multicultural society, Relativism, Ethnocentrism*

504. Effect of green procurement on environmental performance of healthcare firms in Nigeria

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This research examined the influence of sustainable procurement practices on the environmental performance of healthcare firms in Nigeria. It was motivated by the need to determine how integrating sustainability into procurement activities affects critical performance indicators, including financial results, operational efficiency, competitiveness, customer satisfaction, waste management, and corporate image. The findings indicate that sustainable procurement practices exert a strong positive effect on environmental performance. Improvements in cost efficiency, revenue generation, and overall profitability were linked to effective supplier engagement, increased product appeal, and long-term savings. Environmental performance also improved significantly, as sustainable sourcing enhanced process efficiency and strengthened supply chain coordination. Organizations reported better time management and greater supplier reliability, resulting in fewer delays and disruptions. Moreover, the adoption of sustainable procurement strategies contributed to competitive advantage by enabling firms to differentiate themselves in the marketplace and attract new customers. Customer satisfaction and loyalty were also positively influenced, as sustainability initiatives helped build trust and foster long-term relationships. Positive customer perceptions of environmentally responsible practices further enhanced retention rates. In addition, notable progress was observed in waste reduction and resource utilization. Companies improved their management of raw materials and reduced waste through environmentally friendly sourcing practices, thereby lowering their ecological footprint and strengthening their corporate social responsibility commitments. From a reputational standpoint, sustainable procurement enhanced the public image of firms, positioning them as responsible and forward-thinking organizations. In conclusion, the study established that sustainable procurement is vital not only for enhancing financial and operational outcomes but also for achieving competitive advantage and sustaining customer loyalty. It serves as a critical driver of long-term organizational success and relevance in the market. Consequently, the study recommends that manufacturing firms deepen the integration of sustainable procurement practices, while policymakers should provide supportive regulations and incentives to encourage wider adoption.

Keywords: *Organizational Performance, Procurement, Sustainability, Sustainable ProcurementTop of FormBottom of Form*

505. Effectiveness of Pension Fund Investment in Sustaining Nigeria Economic Growth: Questioning the feared phases stimulant

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This study specifically examined the extent increase in Pension fund investment contribute to Economic growth (GDP) in Nigeria, the extent investment in corporate bonds improve economic well-being of retirees and how death of investment instruments affects the life of retirees in Nigeria. Anchored on traditional theory of financial intermediary, the study used partial correlation to know the influence of the dependent variable. With this econometric equation: GDP = β0 + β1PFI +β2CORB +β3EQUI + β4MONI + β5REI +μt, and using the Coefficients: →RGDP = 1.871 +0.380GSI +0.24 +.10CBI + 0.28EQI + 0.22REI, the regression results revealed that though pension fund investments have strong growth-enhancing potential, their effectiveness depend largely on the level of financial market development, regulatory environment and investment diversification strategies. Inline with this findings, the paper proposed that Pension Fund Administrators should diversify their investment portfolio's beyond government securities into more productive sectors such as infrastructure, private equity and corporate financing, regulatory authorities should implement policies aimed at strengthening the corporate bond market. Including encouraging regulatory bodies to create enabling frameworks that will encourage pension funds Administrators (PFA's) to invest more in infrastructure projects such as transportation, energy and housing. This will help address Nigeria infrastructure deficit and stimulate economic growth

Keywords: *Pension fund Investment, Economic growth, Gross Domestic Product , Treasury Bills, Corporate Bonds, Sustainable Economic Growth*

506. Electoral Process and Good Governance: Leveraging on Digital Tools for Electoral Credibility in Nigeria

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The paper examines the application of digital tools in Nigeria's electoral process as a way to promote good governance. The objective of the paper is to determine the adequacy of the use of technology to minimize human interference in the electoral process, and to examine the relationship between a credible electoral process and good governance in Nigeria. It made use of a qualitative method, obtaining secondary data to generate the information required for the study. Findings revealed that while digital tools have been deployed in Nigeria's electoral cycles since 1999, this has not met the acceptable global standard necessary to promote good governance. The study also found that many countries which have improved on the deployment of digital tools have significantly improved good governance to the benefit of their citizens. The paper recommends a more elaborate and strategic deployment of digital tools through constitutional reforms to promote inclusive, efficient, and legitimate democratic governance in Nigeria.

507. Environmental Implications of Cottage Industries on Water Quality of River Ega Kuso & Landzu in Niger South, Niger State, Nigeria

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The study was carried out to assess the Socio-Economic and Environmental Impacts of Local Industries in Niger South, Niger State Nigeria. water samples were collated from three different points in three replica periods along the water course that is upstream, downstream and mid-stream that represent the location of the industries to the water sources. A total of 9 water samples were collected in the entire location. The collected sample analysis was analyzed using standard analytical methods of AOA (1990). Results revealed that Water samples obtained from rivers that flow within the respective industries shows increase in contamination for some physio-chemical parameters. The turbidity values of sampled water from River Ega (9.7 ±0.5NTU, 11 ±0.8NTU, 11.3 ±0.5NTU, and 12.7 ±0.5NTU) and River Landzu (14.7 ±2.1 to 18.3 ±0.5, 15 ±0.8NTU and 16 ±0.8NTU), were above the NSDWQ standard (5NTU).The study recommended that, the cottage industries workers to find ways towards mitigating the impacts of the cottage industries on the communities through utilization of environmentally friendly methods and proper waste infrastructure and management techniques should be employed in the respective industries to avoid pollution and contamination of water courses.

508. Futureproofing Teacher Education: Aligning Nigeria's N C.E Curriculum With 2030 SDG Agenda

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In Nigeria, the fundamental professional qualification in basic education is the Nigeria Certificate in Education (NCE). But as the 2030 deadline for the United Nations Sustainable Development Goals (SDGs) looms, gaps persist between current models of teacher training and global paradigms. This paper evaluates the structural preparedness of the NCE curriculum implemented by the National Commission for Colleges of Education (NCCE) and analyses its alignment with SDG4 which calls for inclusive, equitable, and quality lifelong learning. To identify key systemic vulnerabilities, the study uses a qualitative documentary analysis of existing national policies and teacher reforms. The results show that despite recent structural reforms to the NCE minimum standards, including the creation of specific pathways (such as early childhood and special needs education), the core curriculum continues to be plagued by pedagogical anachronisms, poor funding and flaws in 21st-century digital literacy frameworks. Therefore, the pre-service teachers do not have the tools to foster gender-inclusive classrooms, environmental stewardship, and critical thinking as desired by the 2030 Agenda. Timeline of existing national policies and teacher reforms. The results indicate that the core curriculum still suffers from pedagogical anachronisms, lack of funding and gaps in the 21st century digital literacy frameworks despite the recent structural reforms of the NCE minimum standards which include the introduction of specific pathways. This leads to the pre-service teachers not having the necessary resources to foster critical thinking, gender-inclusive classrooms, and environmental stewardship as demanded by the 2030. Teachers Registration Council of Nigeria (TRCN)to enforce continuous professional development. Ultimately, aligning the NCE curriculum with the SDGs is not merely an educational reform but a developmental imperative to secure Nigeria's socio economic future. By future proofing teacher preparation Nigeria can systematically, develop educators capable of fostering 21st century skills.

509. Global integration of philosophy of science into Environmental Science postgraduate Education: advancing transformative learning for sustainable environmental research and action

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Environmental sustainability challenges, including climate change, biodiversity loss, ecosystem degradation, and increasing uncertainty in environmental decision-making, require researchers who possess not only technical competence but also strong epistemological and philosophical foundations. However, there is evidence that most of the environmental science postgraduate courses in the world are still primarily positivist and technically oriented, and have not integrated a lot of philosophy of science (PoS). This gap plays a role in low critical reflexivity, unfocused interdisciplinary integration and poor translation of research into effective environmental policy and practice in Uganda and many other countries in Sub-Saharan Africa. The purpose of this study was to analyze the inclusion of the philosophy of science in postgraduate studies in environmental science and to create a framework for enhancing the transformative learning and sustainable environmental research. In particular, the study examined the degree of PoS integration, its role in critical thinking, reflexivity and transformative learning, pedagogical approaches that work in the integration of PoS and a framework for the integration of PoS. A systematic review based on the PRISMA 2020 guidelines was carried out on the literature published from 1992 to 2025 from Scopus, Web of Science, ERIC, Google Scholar, and environmental science databases. The results showed that 15% of the programmes had complete integration of PoS and 45% had partial integration. In terms of interdisciplinary integration, students exposed to PoS showed a higher score, as well as a score higher than baseline for mixed-methods justification and bias recognition. Changes in anthropocentric and ecocentric/bionecentric worldviews occurred in 60% and 15%, respectively, of the respondents, respectively. Case-based learning, reflexive research practice, interdisciplinary seminars, problem-based inquiry, and philosophical journaling were used in the pedagogical approaches. This study findings conclude that when the philosophy of science is incorporated, it has a significant impact on transformative learning, methodological rigor and evidence-based environmental decision making. It suggests curriculum changes, faculty development, institutional policy support and incorporation of philosophical reflection in the postgraduate environmental programmes. The study has added a context-specific framework for embedding the philosophy of science in the post graduate training of environmental scientists in Uganda and other similar contexts in Sub-Saharan Africa.

Keywords: *Environmental science education, sustainable research, critical thinking, and evidence-based decision-making.*

510. Higher Education as a partner for SustainableDevelopment:Embedding SDG Impact through Microbiology Research and Innovation in Africa:Embedding SDG Impact

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Higher education institutions in Africa have a strategic role in advancing sustainable development through microbiology research, innovation, and knowledge translation. Microbiology is central to addressing pressing development challenges, including infectious disease control, antimicrobial resistance, food safety, water quality, environmental restoration, and sustainable agriculture. However, the contribution of microbiology within African Higher Education Institutions is often constrained by limited research infrastructure, inadequate funding, weak industry linkages, and insufficient integration of SDG-oriented approaches in teaching and research. This paper examines strategies for embedding Sustainable Development Goal (SDG) impact in microbiology-focused higher education across Africa. It argues that universities can strengthen their development relevance by aligning microbiology curricula with sustainability priorities, promoting problem-based and community-engaged research, and supporting interdisciplinary collaboration with public health, environmental science, agriculture, and biotechnology. The paper further emphasizes the need for institutional frameworks that encourage translational research, support early-career scientists, and facilitate partnerships with government, industry, and communities. Particular attention is given to the potential of microbiology to generate evidence-based solutions for local and regional challenges such as epidemic preparedness, soil health, bioremediation, and waste management. Using a conceptual and policy-oriented approach, the paper proposes that African higher education systems should move beyond SDG awareness toward measurable impact through research innovation, capacity building, and knowledge exchange. The study concludes that microbiology can serve as a powerful lever for inclusive and sustainable development when embedded strategically within higher education institutions committed to Africa's transformation agenda.

Keywords: *Higher Education,Sustainable Development Goals,Microbiology Research,Innovation,Strategies*

511. Impact of Fringe Benefit on the Productivity of Employee in Kaduna Refinery and Petro-Chemical Company Limited

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Despite the strategic importance of the petroleum sector to Nigeria's economy, employee productivity in many refineries remains below expectation due to poor motivation, stressful working conditions, and inadequate welfare packages. In KRPC, concerns have been raised regarding whether existing fringe benefits such as paid vacation, stock options, and life insurance are sufficient to enhance employee performance and organizational efficiency. The study therefore investigated how these fringe benefits influence employee productivity. A survey and cross-sectional research design were adopted, and primary data were collected using structured questionnaires from employees of the organization. The findings revealed that paid vacation significantly improves productivity by reducing stress and improving work-life balance. Stock options were found to enhance employee commitment and ownership behavior, while life insurance had the strongest positive effect by providing financial security and reducing anxiety. The study concludes that fringe benefits significantly enhance employee productivity in KRPC. The study recommends improved welfare policies to sustain productivity levels in the organization.

Keywords: *Fringe Benefits, Employee Productivity, Paid Vacation, Stock Options and Life Insurance.*

512. Integrating construction 4.0 competencies into NCE building Technology Programs for sustainable construction workforce Development in North-West Nigeria

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The construction industry is experiencing rapid digital transformation through the adoption of Construction 4.0 technologies such as Building Information Modelling (BIM), Artificial Intelligence (AI), Internet of Things (IoT), Digital Twins, Robotics, Virtual Reality (VR), and Big Data Analytics. These technologies are redefining workforce requirements and creating demand for professionals equipped with advanced digital and technological competencies. However, many Technical and Vocational Education and Training (TVET) programmes in developing countries,

including Nigeria, have been slow to adapt their curricula to these emerging industry requirements, resulting in a persistent digital skills gap among graduates. Studies have emphasized the growing need for construction professionals to possess both technical and digital competencies to effectively participate in technology-driven construction environments. This study investigates the integration of Construction 4.0 competencies into Nigeria Certificate in Education (NCE) Building Technology programmes as a strategy for promoting sustainable construction workforce development in North-West Nigeria. Specifically, the study seeks to identify the Construction 4.0 competencies required by the contemporary construction industry, examine existing digital skills gaps within NCE Building Technology programmes, determine factors influencing curriculum integration, explore effective integration strategies, and develop a framework for implementation.The study adopts a mixed-methods research design involving Building Technology lecturers, final-year NCE Building Technology students, curriculum experts, and construction industry professionals drawn from Colleges of Education and construction organisations within North-West Nigeria. Data will be collected using structured questionnaires and expert validation instruments. Descriptive statistics, mean ratings, standard deviation, t-test, regression analysis, and framework development procedures will be employed for data analysis.The expected outcome of the study is a validated framework that will guide the integration of Construction 4.0 competencies into NCE Building Technology curricula. The framework is anticipated to enhance digital literacy, technological adaptability, employability, and workforce readiness among graduates while strengthening the alignment between technical education and industry needs. The study contributes to curriculum innovation, digital transformation in TVET, and sustainable construction workforce development, thereby supporting Nigeria's aspirations for industrial growth, technological advancement, and sustainable infrastructure development. Keywords: Construction 4.0, Building Information Modelling (BIM), NCE Building Technology, Digital Skills, Curriculum Integration

513. Integrating Health Economics into Science Education for Sustainable Development: Challenges Facing Nigerian Colleges of Education in Achieving Sdgs 3

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This study examined the role of health economics in science education forsustainable development and the challenges faced by Nigerian college ofEducation in achieving Sustainable Development Goal 3 (Good Health andWell-being). The paper explored common misconceptions about scienceeducation as well as its benefits. It further recommended that thegovernment should equip research institution with adequate scientificfacilities and resource to enable Nigerian scientists to conduct effectiveresearch that contributes to National economic development. The paper alsoexplored common misconceptions about science education as well as itsbenefits. The work addressed the relevance of science education to theSustainable Development Goals (SDGs 3) in Nigeria. The sustainabledevelopment goal is a transformative plan of a Nation towards improving itseconomy, social and environmental systems. Out of the ten (10) sustainabledevelopment goals identified in this paper, it discussed five (5) of them thatare relevant to science exhaustively. These include; hunger and food security,quality education, good health services, provision of clean water andsanitation among others. The implication to National development of thesustainable development goals was also stressed. The data showed thatabout one in eight people still lived in extreme poverty global, nearly 800million people suffered from hunger, the birth of nearly quarter of childrenunder 5 had not been recorded (Ban, 2016). According to Ban, about onemillion people were living without electricity and water scarcity affected morethan two million people. The goals apply to all society, even the wealthiestcountries have yet to fully empower or eliminate discrimination. Theprevailing culture (religious beliefs and myths) of any society greatlyimpinges on how science is perceived and practiced in that society (Enema,2004).

514. Integrating Sustainable Development Goals into Technology Education Curricula in Nigerian Colleges of Education: A Competency-Based Model for Teacher Preparation and Green Skills Development

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Despite Nigeria’s commitment to Agenda 2030, Technology Education curricula in Colleges of Education appear insufficiently mapped to the competencies required for sustainable development. Technology education is critical for equipping pre-service teachers with skills that drive national development, yet concerns persist about curriculum

mismatch with global priorities such as the UN Sustainable Development Goals. This proposed study aims to examine the extent of congruence between the current NUC/NCCE Dual Mandate Technology Education curriculum and SDG 4 – Quality Education, SDG 9 – Industry, Innovation and Infrastructure, and SDG 12 – Responsible Consumption and Production. Using a combination of survey and document analysis, the study will review NUC/NCCE curriculum documents, administer questionnaires to lecturers and final-year students in selected federal Colleges of Education, and conduct focus group discussions with lecturers and Federal Ministry of Education curriculum officers. The study will identify gaps in content coverage, pedagogical approaches, and assessment practices related to sustainability and green technologies. Based on the findings, a competency-based model will be proposed to guide curriculum reform through SDG-based learning outcomes, project-based learning, and school -industry collaboration. The study is expected to provide practical recommendations for NCCE, NUC, and the Federal Ministry of Education to embed SDG targets into curriculum review cycles, teacher training, and assessment frameworks.

Keywords: *Technology Education, Curriculum Mapping, Sustainable Development Goals, Dual Mandate; Teacher Training; Colleges of Education,*

515. Moderating Role of Audit Committee Financial Expertise on Firm Attributes and Financial Reporting Quality of Listed Consumer Goods Firms in Nigeria

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This study examines the moderating role of audit committee financial expertise on firm attributes and financial reporting quality of listed consumer goods firms in Nigeria for the period of 2013 to 2025. Firm attributes as the independent variable of the study is proxied by profitability, leverage and foreign diversification, while financial reporting quality as the dependent variable of the study is proxied by discretionary accruals. The population of the study consists of the 21 consumer goods firms listed in the Nigerian Exchange Group, while the sample size is 20 firms which was arrived at using filter sampling technique. The study collected secondary data from the annual reports and accounts of the selected firms which was analysed using multiple regression as technique of data analysis. The result shows a positive significant relationship between profitability, leverage, foreign diversification and financial reporting quality of listed consumer goods firms in Nigeria. The study recommends that the management of listed consumer goods firms in Nigeria should put more efforts and strategies to manage their leverage efficiently and effectively towards income generation to their companies for profitability improvement. Also, they should expand the size of their business operation in order to have more market penetration of their products and services to foreign market.

516. Oil Price Volatility and Economic Development in Nigeria

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This study examined the relationship between oil price volatility on economic development in Nigeria using monthly time series data spanning 1988–2025. Economic development was proxied by poverty, unemployment, and income inequality, while oil price volatility was measured using the standard deviation of international crude oil prices. The study employed advanced volatility models such as Autoregressive Conditional Heteroskedasticity (ARCH) techniques, specifically the GARCH, EGARCH, and TGARCH models, to capture the symmetric and asymmetric effects of oil price fluctuations. Inflation and interaction terms were incorporated to account for macroeconomic dynamics. The findings revealed that oil price volatility has a negative and statistically significant effect on poverty across the GARCH, EGARCH, and TGARCH models, suggesting that oil price fluctuations reduce poverty by improving government revenue. Inflation also reduced poverty, whereas the interaction between oil price volatility and inflation exerted a positive effect on poverty. Similarly, oil price volatility had a negative and significant effect on unemployment across all three models, while inflation also reduced unemployment. However, the interaction between oil price volatility and inflation positively and significantly influenced unemployment, indicating that their combined effects increase unemployment in the short run. For income inequality, oil price volatility exerted a negative and significant effect across all models. Inflation had a positive and significant effect in the GARCH and EGARCH models but a negative and significant effect in the TGARCH model. The interaction between oil price volatility and inflation reduced income inequality in the GARCH and EGARCH models but increased it in the TGARCH model. The study concludes that oil price volatility significantly influences economic development in Nigeria. It recommends that government should channel oil revenue gains into productive sectors and expand employment-intensive public investment programmes to enhance inclusive economic development.

Keywords: *Oil price, Volatility, Economic Development, Poverty, Inflation, Unemployment, Income Inequality*

517. Predictive Analytics Capability and Sustainable Entrepreneurial Practices in Informal Food Supply Chains: the Role of Entrepreneurial Innovative Capability in North-Western Nigeria

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Informal food supply chains in North-Western Nigeria face persistent challenges in achieving sustainability due to weak predictive analytics capability and limited integration of innovation-driven decision-making processes. This study examines the relationship between predictive analytics capability and sustainable entrepreneurial practices, the moderating role of entrepreneurial innovation adoption capability. Using descriptive survey and correlational research designs and partial least squares structural equation modeling (PLS-SEM), data were collected from 537 informal food supply chain actors across the region. The findings reveal that intuitive demand forecasting capability ($\beta = 0.31$, $p < .01$), record-based planning capability ($\beta = 0.28$, $p < .01$), mobile-assisted forecasting capability ($\beta = 0.34$, $p < .01$), and market signal interpretation capability ($\beta = 0.37$, $p < .01$) each exhibit a positive and statistically significant relationship with sustainable entrepreneurial practices. Furthermore, entrepreneurial innovation adoption capability significantly moderates these relationships, resulting in enhanced effect sizes: intuitive demand forecasting ($\beta = 0.39$, $p < .01$), record-based planning ($\beta = 0.35$, $p < .01$), mobile-assisted forecasting ($\beta = 0.43$, $p < .01$), and market signal interpretation ($\beta = 0.47$, $p < .01$). These results suggest that the integration of innovation adoption capability amplifies the effectiveness of predictive analytics in driving sustainability-oriented entrepreneurial outcomes. The study contributes to the literature by extending analytics capability frameworks to informal economies and provides practical implications for fostering sustainable entrepreneurial practices through innovation-enabled predictive decision-making.

518. Preparing Future-Ready Graduates for Sustainable Development: The Role of Digital Skills in African Higher Education

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The emergence of the Fourth Industrial Revolution has transformed the global landscape of education, employment and innovation, where digital competency has become the most essential aspect of sustainable development. Higher education institutions across Africa are increasingly expected to produce graduates equipped with the knowledge, skills and competencies required to thrive in a digitally driven and knowledge-based economy. However, many higher institutions of learning across Africa, particularly colleges and polytechnics, continue to face challenges associated with inadequate digital infrastructure, limited technological access, curriculum obsolescence and insufficient digital literacy amongst both students and lecturers. This paper examines the role of digital skills of future-ready graduates capable of contributing meaningfully to sustainable development and the achievement of sustainable development goals (SDGs). The paper attempts to analyse the relationship between digital transformation, employability of future graduates, innovation and sustainable development in higher institutions of learning. The study identifies key barriers to digital skills acquisition and proposes strategic interventions for strengthening digital capacity within African higher education institutions. The paper concludes that integrating digital skills into higher education curricula is essential for building resilient, innovative, and globally competitive graduates capable of addressing Africa's developmental challenges.

519. Role of Dietitians in Advancing Sustainable Food Guidelines for Nigeria's Future

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Nigeria faces a dual burden of malnutrition and environmental pressure, with rising rates of obesity, micronutrient deficiencies, and food insecurity alongside climate vulnerability, post-harvest losses, and overreliance on imported foods. As food systems transform, sustainable dietary guidelines offer a pathway to improve public health while protecting natural resources. This paper examines the role of dietitians as central actors in advancing and implementing sustainable food guidelines for Nigeria's future. Drawing on nutrition science, food systems analysis, and

public health practice, we argue that dietitians are uniquely positioned to bridge the gap between nutrition recommendations and environmental sustainability. Their roles include: 1) translating global sustainability principles into culturally relevant Nigerian dietary patterns that emphasize indigenous grains, legumes, fruits, vegetables, and sustainably sourced animal proteins; 2) influencing food policy, school feeding programs, and hospital nutrition services to prioritize low-impact, nutrient-dense foods; 3) leading community and patient education to shift consumption toward seasonal, local, and minimally processed foods; and 4) collaborating with agriculture, industry, and government to reduce food waste and promote resilient food value chains. We further highlight capacity gaps, including limited training on sustainability, weak integration into policy development, and resource constraints within the profession. Strengthening dietetic education, research on Nigerian food footprints, and intersectoral partnerships will be critical. In conclusion, positioning dietitians at the forefront of guideline development and implementation can help Nigeria achieve food and nutrition security, reduce diet-related diseases, and meet climate commitments. Their expertise is essential for building food guidelines that are healthy for people and for the planet.

Keywords: *dietary, food guidelines, nutrition security, healthy practice*

520. Strategies Used by Housewives in Meeting the Food Needs of the Families in Ughelli, Delta State

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Food security is a critical concern globally, as it directly affect the well being and livelihoods of individuals and communities. At the household level, several factors influence the ability to achieve and maintain food security and for optimum development, survival, growth and good health of family members housewives help them with the knowledge of food in making wise budgets for food items, which in turn help them meet the food needs of family Therefore this study investigated the strategies used by housewives in meeting the food needs of families in Ughelli, Delta State. A cross sectional study was adopted using multi stage sampling technique to select 345 housewives among the communities that make up the L.G.A. A well structured and validated questionnaire was used to collect information on socio economic characteristic, foods available in the study area, food consumption pattern of family, strategies used by housewives in meeting the food needs of families. Data were analysed using Descriptive statistics (frequency, percentage, charts and Mean). The result showed that Majority (67.7%) of them are middle age and 4.0% are older adults .Only 19.0% of them earn aboveN100,000,94.7% are married while only 1.3% are widow. Majority (55.7%) has a family size of 4-6.Major meals consumed by families in Ughelli community Include Ukodo, Irhoboto, Pepper Soup, Banga Soup, Owho Soup, Rice, Starch, Garri, Tapioca, Yam, Cocoyam, Beans, Plantain Among Others. Banga soup has the highest mean of 3.73 while Cocoyam has the least mean of 3.27 food consumption pattern of family shows Majority (75.7%) of them eat thrice a day only 0.7% of them only eat once a day. In the last 30 days, 53.7% of them were hungry because of no food and the remaining 43.3% never suffer hunger. Strategies employed by housewives in meeting the food needs of family members in Ughelli include, Cultivating Home Gardens, Budgeting Family Income, Buying Food In Season, Proper Preservation Of Food Items, Sales Of Farm Produce, Proper Processing Of Food Items, Multiple Source Of Income And Bulk Purchasing. Budgeting Family Income Strategy Has The Highest Mean Of 3.35, Followed By Proper Preservation Of Food Items (3.31), And Then Cultivating Home Garden Of 3.29. Proper Processing Of Food Items Strategy Has The Lowest Mean Of 3.20. The result of the findings showed that despite the high involvement of housewives in meeting food needs, a large percentage of the households were food insecure. A very low percentage of the households had enough to eat and to store also low intake level of vegetables and fruits was observed. This study recommended that experts involved in nutrition programs and research collaborate with experts in promotion of income, production-focused inputs, labor-saving technology, microfinance, social networks, and human capital. Through such collaboration, nutritionists could add nutrition components to these other programs and evaluate the benefits to family nutrition including strategies to improve access to food, promote family care and health, and gain access to the resources needed to accomplish these.

521. Sustainability and the future Aligning, Higher Education to the sustainable Development Goal (SDGs)

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S: High Education institutions as critical actors in advancing global sustainability, continued to function with governance structures, curricular and research priorities that remain insufficiently aligned with the Sustainable

Development Goals (SDGs), despite the adoption of the United Nations 2030 agenda. This disconnect has impacted the capacity of graduates of these institutions to address complex social, economic and environmental challenges. This paper seek to examines strategic pathways for aligning higher education with the SDGs, with the focus on curriculum reforms, institutional operations and stake-holders engagement. The paper argues that integration of sustainability principles across disciplines, adoption of policies such as green compus and strengthening partnership with industries, local communities and governments are essential mechanism for transformation. The discussion highlights both opportunities and systemic barriers to implementation, drawing on current literature and institutional case studies, which includes funding constraints, disciplinary silos and management challenges. The analysis concludes that aligning higher education with SDGs is not merely imperative ethically but a strategic necessity. Higher education can produce graduates equipped with the competences and values required to lead resilient, inclusive and sustainable development in the 21st century by embedding sustainability into its core mission

522. Sustainability and the future: Aligning higher education with the sustainable development goals (SDGs)

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The integration of sustainability into higher education has become a critical pathway for advancing the United Nations Sustainable Development Goals (UNSDGs). Universities and other higher institutions serve as center of knowledge creation and propagation; hold a distinctive responsibility to align curricula, research, and institutional practices with global sustainability. This paper explores how higher education can serve as a transformative agent in embedding the SDGs into teaching, learning, and governance structures. It examines the role of interdisciplinary approaches, policy frameworks, and community engagement in fostering sustainable mindsets among students and faculty. Also, the study highlights challenges such as resource constraints, institutional inertia, and the need for global collaboration, while also identifying opportunities for innovation through digital technologies, green campus initiatives, and partnerships with industry and civil society. By aligning higher education with the SDGs, institutions not only contribute to global sustainability but also prepare graduates to become proactive leaders in addressing complex social, economic, and environmental challenges. This alignment underscores the future of education as a catalyst for sustainable development, ensuring that academic institutions remain relevant and impactful in an era defined by ecological and societal transformation.

Keywords: *Sustainable Development Goals, Higher Education, Sustainability, Curriculum Integration, Community Engagement, Digital Innovation*

523. Sustainable Development Goal 4 and Achievement of Quality Education in Nigeria

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Sustainable Development Goals (SDGs) is a universal call adopted by United Nations in 2015 to end poverty, protect the planet and ensure that by 2030 all people will enjoy peace and prosperity. These 17 interconnected goals aim to address global challenges of poverty, inequality, climate change and environmental degradation. Sustainable Development Goal 4 will enhance individual well-being anchored on life-long learning opportunities for all by 2030 focusing on quality primary and secondary education, early childhood development, technical and vocational training. The challenges faced by Nigerians in achieving SDG 4 are high rate of out of school children, regional disparities to access education and the need to improve quality learning. The paper adopted a descriptive historical research design for the study, data were gathered from the official websites of government, inter-governmental organizations and national newspapers that were purposively selected and compared to clarify how to integrate this in school curriculum in Nigeria either to create new one or infuse new contents in the existing ones. This is preferable because the curricula of our schools are saturated with work load to accommodate more subjects and re-orientate teachers to implement new curricula through pre-service and in-service training. The practice for the attainment of Sustainable Development Goal 4 includes appropriate teachers preparation, improved methods, resources, and facilitates. There is need to accommodate all categories of children both able and disable, boys and girls in providing furniture, playing and toilet facilities. This will ensure inclusive and equitable quality education for all by 2030 in Nigeria where there is inadequate facilities for education.

Keywords: *SDG, inequality, Climate Change, Quality Education, Poverty*

524. Sustainable Transformation of Higher Education: Aligning Institutions with Global Development Goals

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There is no gainsaying that “sustainability" and the "future” are Siamese twins that deserve greater prominence in higher education curricula if the overall aims of the Sustainable Development Goals (SDGs) are to be achieved. Sustainable development refers to development that meets present needs without compromising the ability of future generations to meet their own needs. The United Nations 2030 Agenda for Sustainable Development underscores the pivotal role of higher education in achieving the 17 SDGs. Despite this well-thought-out mandate, tertiary institutions in developing economies grapple with structural constraints such as funding deficits, curriculum inertia, and a weak academia-industry nexus, which undermine their capacity to contribute meaningfully to sustainable development. Against this backdrop, this paper addresses the gap by proposing a “CORE” institutional alignment framework. The framework integrates four strategic approaches: curriculum mainstreaming of SDGs, campus operations for sustainability, research focused on local SDG challenges, and engagement through partnerships with MDAs, industry, and communities. The paper argues that institutional alignment does not necessarily require additional budgetary allocation, but rather a paradigm shift in institutional vision and practice. It further demonstrates that SDG-aligned tertiary institutions can advance SDG 4 on quality education while catalyzing progress in SDG 1, SDG 8, and SDG 13. It concludes that infusing SDGs into the core functions of teaching, research, and service is critical for producing future-ready graduates and positioning institutions as agents of sustainable national transformation.

525. The unemployed youth in Animal Agriculture: A tool for sustainable development in Borno state, Nigeria

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Youth unemployment is a problem in north eastern Nigeria especially Borno state. Negative effects of unemployment such as underdevelopment and increased crime rate has continued to bedeviled the entire region in the past decade. As a result, it became necessary to find solutions to the issue of youth unemployment in the state. No doubt, Animal Agriculture have reduced unemployment in many parts of the world (Africa inclusive), although the skills need to be ascertained before it is adopted as a tool for employment. Two research questions were posed to guide the study while two null hypotheses were formulated and tested at 0.05 level of significance. The study adopted survey research design conducted in Borno state of Nigeria. A total of 121 consisting of Agricultural science lecturers (77) and extension agents (44) was the population of the study and because of the manageable size of the population used, the entire 121 respondents were involved in the study. Structured questionnaire as instrument for data collection was validated and established at coefficient of 0.72. All data collected were analyzed using mean and standard deviation for answering the research questions. In conclusion the study identified employable skills required by the youth in Animal Agriculture. The study recommended among others; Government should adequately provide funds for training/retraining of Agricultural science lecturers and extension agents in animal agriculture production to enable them master the skills to step it down for the youth.

526. Urbanisation Dynamics, Dietary Diversity and Food Security Challenges in South-South Nigeria: Implications for Sustainable Urban Development

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Rapid urbanisation is transforming food consumption, livelihoods and access to nutritious food, creating challenges for food security and sustainable urban development. This study examined urbanisation dynamics and their implications for food security in the South-South geopolitical zone, focusing on dietary diversity and food expenditure. A four-stage sampling procedure was adopted. Rivers and Edo States were randomly selected, while Port Harcourt and Benin City were purposively selected because of high urbanisation. Nine Enumeration Areas were randomly selected from each city, and four households were selected from each Enumeration Area using the Yamane model. Data were collected on socioeconomic characteristics, urbanisation indicators, consumption and expenditure. Principal Component Analysis was used to construct an Urbanicity Index, categorised into Low, Medium and High Urbanicity, while the Dietary Diversity Index was classified into low, medium and high levels using FAO guidelines. Data were analysed using

descriptive statistics, the Quadratic Almost Ideal Demand System, Berry Index and Multinomial Logit Regression Model at 0.05 significance. Results showed an average household-head age of 49 years, a household size of five persons, and the monthly income reported in the original submission. Root and tuber foods recorded the highest budget share across categories. Food demand was significantly influenced by income, household size, occupational status, social-group membership and urbanicity. Food security was associated with male-headed households, social-group membership and occupational status. The study recommended rooftop and community gardens, vertical farming, improved transportation and public awareness to strengthen sustainable urban food systems and advance SDGs 2 and 11.

Keywords: *Urbanisation dynamics, dietary diversity, food security, urban households, food expenditure, sustainable urban development, Nigeria*

Other Submissions

1 abstracts

527. Bridging the Digital Divide in the Teaching and Learning of Social Studies in Nigerian Tertiary Institutions: A Case Study of Federal College of Education, Ilawe Ekiti, Nigeria

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Today, globally, digital tools utilization and its impact to effective organization have been well acknowledged. However, digital divide posts as a great challenge to it, thus, necessitated this study. The population of the study comprised lecturers and students at Federal College of Education, Ilawe Ekiti, Ekiti State, Nigeria. The sample size of the study was n inety - eight (98) respondents selected from Social Studies Department. Eight (8) lecturers were purposively selected, while t hirty (30) students, across the three levels of the Department were selected, through a simple sampling technique using ballot paper. Two research questions were raised. Data were obtained through researchers-developed research instruments titled "Questionnaire on Bridging the Digital Divide in Teaching and Learning of Social Studies at Federal College of Education, Ilawe Ekiti". It was fashioned on four likert rating scale; Strongly Agreed (SA), Agreed (A), Disagreed (D) and Strongly Disagreed (SD), rated on 4, 3, 2 and 1 points, respectively. The research instruments were validated by experts in m easurement and e valuation. Its reliability was determined, through Alpa Cronbach. 0.71 coefficient reliability was established. Based on the results conclusions were made that lecturers and students had negative disposition to digital usage, and that Federal College of Education, Ilawe Ekiti, Nigeria was not well supplied with digital devices or tools. Recommendations were made that schools should be well equipped with digital tools. The school M anagement should make adequate provision for maintenance of digital tools. Also, both lecturers and students should be well educated on the benefits of using digital tools for their various academic activities, and so on.

Late Submissions

10 abstracts

528. A Unified Comparative Taxonomy and Techno-Economic Evaluation of Non-Battery Energy Storage Technologies: A Master Technical Comparison Matrix Across Mechanical, Thermal, Electromagnetic,...

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Integrating high shares of variable renewable energy (VRE) into modern power networks creates storage requirements spanning milliseconds for inertial stabilization to months for seasonal balancing. Although closed electrochemical battery packs dominate the 1-to-4-hour diurnal arbitrage market, their coupled energy-to-power cost scaling, cycle degradation, and critical-mineral dependencies restrict their viability for high-power transient buffering and multi-day or seasonal long-duration energy storage (LDES). Beyond electrochemical cells, ten primary storage modalities underpin utility-scale grid decarbonization: (1) Pumped Hydroelectric Energy Storage (PHES), (2) Solid Gravity Energy Storage (SGES), (3) Compressed Air Energy Storage (CAES), (4) Liquid Air Energy Storage (LAES), (5) Flywheel Energy Storage Systems (FESS), (6) Sensible Heat Storage (SHS), (7) Latent Heat Storage (LHS), (8) Thermochemical and Pumped Thermal Electricity Storage (TCES/PTES), (9) Electrochemical Double-Layer Capacitors (EDLCs), and (10) Superconducting Magnetic Energy Storage (SMES) alongside Power-to-Gas (PtG) hydrogen and electrofuel pathways. This study develops a standardized thermodynamic and techno-economic framework to benchmark all ten modalities in a Master Technical Comparison Matrix covering round-trip efficiency (RTE), discharge duration, operational scale, Technology Readiness Level (TRL), decoupled capital cost structure, engineering advantages, and deployment constraints. A four-tier, multi-timescale grid-mapping taxonomy is also established to assist utility planners, engineers, and policymakers in designing complementary non-battery storage portfolios.

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Keywords: *Non-Battery Energy Storage; Master Comparison Matrix; Long-Duration Energy Storage (LDES); Round-Trip Efficiency; Mechanical Storage; Thermal Storage; Supercapacitors; SMES; Power-to-Gas; Grid Decarbonization.*

529. Automated Services versus Human Services in the Hospitality Industry: A Comparative Analysis of Service Quality and Customer Satisfaction

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Hospitality firms are automating more of the guest journey, yet it remains unclear when automated delivery matches, exceeds or falls short of human service in terms of service quality and satisfaction. This article compares the two modes of delivery and asks how the answer changes in a market where infrastructure is a binding constraint, using the Nigerian hospitality industry as the case. An integrative review of empirical and review studies on service robots, self-service technology and hotel technology is organised around SERVQUAL, expectation–disconfirmation theory and the technology acceptance model. It is followed by an instrumental case analysis of Nigerian hospitality that draws on national connectivity, power and payment indicators and on the small body of Nigerian studies of hotel technology. The evidence supports neither mode as generally superior. Automation performs well on reliability, speed and access in routine, information-based tasks, while human service keeps its advantage in empathy, trust-building and service recovery. In the Nigerian case, uneven grid power and connectivity sit alongside highly developed digital payments, which makes continuity of service, rather than technological sophistication, the decisive design problem. The article proposes a task–channel fit framework, adds service continuity as a dimension of automated service quality, and sets out six testable propositions. Managers should automate transactional touchpoints, keep a visible human fallback, and treat power and connectivity resilience as part of service design rather than as a facilities matter. The article extends comparative service-quality research to a setting in which infrastructure cannot be assumed, and provides a Nigeria-specific research agenda.

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Keywords: *Automated Services; Human Service; Service Quality; Customer Satisfaction; Hospitality; Service Robots; Hybrid Service; Nigeria*

530. Digital Accounting Technologies and Financial Sustainability in Federal Higher Education Institutions in Delta State, Nigeria: An Integrative Conceptual Framework

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The financial sustainability of public higher education institutions depends on their capacity to mobilize, allocate, monitor and use resources while meeting present obligations and preserving future service capacity. Federal higher education institutions in Nigeria operate amid funding uncertainty, rising operating costs, competing expenditure demands and pressure to diversify revenue. This conceptual paper develops an integrative framework explaining how accounting information systems (AIS), artificial intelligence (AI)-enabled accounting, cloud accounting and financial data analytics may contribute to institutional financial sustainability through financial management effectiveness. Methodologically, the paper adopts a theory-driven conceptual integration approach, drawing on 14 selected academic and institutional sources, comprising 12 journal articles and two institutional publications, and integrating the DeLone and McLean Information Systems Success Model, the Resource-Based View and the Technology Acceptance Model. The conceptual synthesis identifies four digital accounting technology domains and establishes financial management effectiveness as the principal mediating mechanism linking these technologies to financial sustainability. The proposed framework further identifies digital infrastructure, professional capabilities, management commitment, cybersecurity, data governance and internal controls as six enabling moderating conditions. Financial sustainability is conceptualized through four dimensions: revenue diversification, expenditure efficiency, liquidity management and budget resilience. The findings suggest that digital accounting technologies can strengthen institutional financial sustainability when their capabilities are translated into effective financial management processes and supported by appropriate organizational resources and governance mechanisms. The paper concludes that digital accounting should be approached as a strategic financial-governance initiative rather than merely a technology acquisition exercise. The proposed framework provides a theoretical foundation for future empirical investigations in federal higher education institutions in Delta State, Nigeria.

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Keywords: *Digital accounting technologies; financial management effectiveness; financial sustainability; higher education institutions; Nigeria.*

531. Digital Transformation in Colleges of Education: Challenges and Opportunities for Effective Students Records Management

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Digital transformation is increasingly shaping administrative processes in higher education, particularly Colleges of Education. This includes the creation, storage, retrieval, preservation and use of student records. For Colleges of Education, reliable records are essential to admissions, registration, assessment, progression, graduation, transcript production, institutional planning and accountability. Yet the move from paper-based procedures to digital systems is not simply a technical upgrade: it requires institutional capacity, reliable infrastructure, staff competence, sound records governance and safeguards for personal data. This paper critically examines the challenges and opportunities associated with digital transformation in student records management, with particular attention to the Nigerian and wider African higher-education context. Employing a narrative literature-based review approach, the paper draws on records-management standards, information-systems theory, international education policy and selected empirical studies from Nigeria. The Technology–Organisation–Environment (TOE) framework is proposed as the principal lens for analysing institutional adoption, while the DeLone and McLean Information Systems Success Model is used as a complementary framework for evaluating outcomes. The analysis indicates that infrastructure deficits, unreliable electricity and connectivity, limited funding, uneven digital skills, fragmented procedures, resistance to change, weak maintenance and privacy/security risks may constrain implementation. Conversely, well-governed digital systems can improve retrieval speed, data consistency, service delivery, auditability, preservation and evidence-informed planning. These benefits are conditional rather than automatic. The paper argues for phased implementation, user participation, lifecycle-based records policies, sustainable financing, staff development, interoperability, tested backup and recovery arrangements, and compliance with Nigeria's data-protection framework. It concludes that successful transformation should be assessed by records quality, service outcomes, trust and institutional resilience—not by technology acquisition alone.

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Keywords: *Digital transformation, student records management, Colleges of Education; Technology–Organisation–Environment framework, information systems success, data protection in Nigeria.*

532. Diverse Behaviours Among Students in Higher Learning Institutions and Secondary Schools in Musanze District, Rwanda: Perceived Causes, Consequences and Support Needs, with Emerging Digital...

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This study explored student behaviours, their perceived contributing factors, consequences and support needs in selected higher learning institutions and secondary schools in Musanze District, Northern Rwanda. A qualitative approach was employed, involving seven focus-group discussions with 60 participants (29 females and 31 males) from five institutions. Data were collected in Kinyarwanda and English and analysed using qualitative content analysis. Participants described positive behaviours, including collaboration, mutual support, sports participation and academic cooperation, alongside negative behaviours such as substance abuse, theft, sexual misconduct, truancy and academic dishonesty. They attributed these behaviours to peer pressure, poverty, family background, psychological distress, social-media influence and inadequate institutional monitoring. Reported consequences included poor academic performance, school discontinuation, addiction, psychological distress, insecurity and family financial burdens. To address these challenges, participants recommended strengthened institutional discipline, sensitisation programmes, counselling services, greater parental involvement, student clubs and closer collaboration among educational institutions, families and local authorities. Digital issues were not a pre-specified focus of the study. Nevertheless, social-media influence and examination misconduct emerged spontaneously in participants' accounts, although their prevalence and specific forms were not investigated. Technology-mediated behaviour is therefore used in this paper as an interpretive perspective rather than as an empirical finding. Taken together, participants' accounts highlight the need for an integrated, supportive and collaborative approach to student behaviour that recognises the interconnected nature of both physical and digital learning environments, and that balances disciplinary measures with guidance, psychosocial support and community engagement.

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Keywords: *Student behaviours; Positive and negative behaviours; Technology-mediated behaviour; Educational institutions; Musanze District; Rwanda.*

533. Ecoliterature as a Pedagogical Resource for Sustainable Development: Repositioning Literary Studies in Nigerian Higher Education

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This paper examines the potential contribution of ecoliterature to sustainability education in Nigerian higher education, with particular attention to its capacity to connect literary interpretation with the United Nations Sustainable Development Goals (SDGs). It conceptualises ecoliterature as writing that represents human–environment relationships and interrogates ecological degradation, resource exploitation, environmental inequality, and community survival. It also considers higher education institutions as important spaces for developing the knowledge, values, and competencies required for sustainable development. Adopting a qualitative, text-centred approach, the paper analyses selected Nigerian literary works in relation to relevant SDGs. These include Chimeka Garricks' Tomorrow Died Yesterday (SDGs 4 and 16); Oyeh Otu's Shanty Town (SDG 6); Tanure Ojaide's The Tale of the Harmattan (SDG 11); Nnimmo Bassey's We Thought It Was Oil but It Was Blood (SDGs 12 and 13); Ibiwari Ikiriko's Oily Tears of the Delta (SDG 14); Kaine Agary's Yellow-Yellow (SDG 15). Through purposive selection, the study identifies a limited number of SDGs and literary texts whose thematic concerns and objectives demonstrate clear intersections, rather than attempting an exhaustive examination of all 17 SDGs. The discussion demonstrates how literary representations of pollution, biodiversity loss, climate disruption, water insecurity, displacement, corruption, and environmental injustice can support critical reflection and interdisciplinary learning. It argues that ecoliterature offers significant pedagogical possibilities for advancing sustainability education, complementing scientific and policy approaches while connecting global development goals to Nigeria's specific environmental realities.

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Keywords: *Ecoliterature, sustainability education, higher education, sustainable development goals, environmental consciousness*

534. Effects of Light-emitting Diodes (LEDs) on Stomatal Ultrastructure, Leaf Morphology, and Genetic Stability in Musa acuminata (AAA) cv. Red Banana Plants

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The red banana (Musa acuminata) is valued for its nutritional, agronomic, food science and technological uses, and therefore continues to be the subject of research aimed at sustainable utilisation. Micropropagation makes an important contribution to its production, as it enables the mass production of healthy plants with the desired characteristics within a few months. Despite extensive use of light-emitting diodes (LEDs) in banana micropropagation, there is limited integrated evidence on how specific LED spectra influence genetic stability in Musa acuminata cv. red banana. Regenerated Musa acuminata cv. red banana plantlets were established using Murashige and Skoog medium supplemented with 2 μM Thidiazuron (TDZ) under six (6) different LED spectra treatments; white (400– 700nm), blue (440nm), red (660nm), far-red (720nm) mint-white (500-599 nm) and blue + red (440nm + 660nm). Stomatal research revealed that white LED provided the highest stomatal density, while far-red and mint-white LED provided the lowest. Blue LED increased stomatal width and length, while mint white LED produced the highest length-to-width ratio. Anatomical analysis showed that mint-white and red LEDs affected both the abaxial epidermis and adaxial hypodermis, while white, blue, blue-red, and red LEDs produced well-differentiated palisades and spongy parenchyma. Genetic stability analysis was performed on the in vitro plants of Musa acuminata cv. red banana. Twenty (20) primers of each SCoT, ISSR and DAMD molecular marker were used to assess the genetic stability of the six (6) samples of Musa acuminata cv. red banana. This study revealed that inter simple sequence repeats (ISSR) and directed amplification of minisatellite DNA (DAMD) markers (DNA primers) are sufficient in determining the polymorphism and monomorphism percentage among the samples. SCoT markers showed 92.74% monomorphism, ISSR markers showed 95.57% of monomorphism whereas DAMD markers showed 84.44% monomorphism. Polymorphism of 15.56% was the highest observed under DAMD markers. However, the combine molecular markers showed 91.12% monomorphism and a Polymorphism of 8.88%. This indicates that certain wavelengths of LEDs help to maintain genetic stability and improve morphological characteristics of micropropagated red banana plants, providing an energy-saving and cost-effective method for mass propagation with minimal somaclonal variation.

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Keywords: *micropropagation, molecular markers, polymorphism, red banana, stomata morphology*

535. Functional Characterization of Fiber-Enriched Millet-Malted Mungbean-Tigernut Breakfast Cereals Blends

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This study evaluated the functional properties of fiber-enriched breakfast cereals formulated from millet, malted mungbean and tigernut flours using quadratic response surface models. The results showed that blend composition significantly influenced bulk density (BD), water absorption capacity (WAC), oil absorption capacity (OAC), solubility (S), emulsification capacity (EC), and foam stability (FS) ($p<0.05$), while wettability, viscosity, swelling index, gelatinization temperature, and foam capacity were not significantly affected. Malted mungbean flour played a key role in reducing BD and improving WAC and OAC, indicating its suitability for producing lighter cereals with improved hydration and flavor retention. Significant ($p<0.05$) interaction effects among the flours, particularly for WAC and EC, highlighted the importance of optimized blend combinations. Foam stability exhibited the highest model predictability (Adj. R^2 = 0.8596), mainly enhanced by millet inclusion. However, these findings support the development of nutritionally enhanced, consumer-acceptable breakfast cereals with improved reconstitution, texture, and stability, suitable for children, adults, and the elderly, and valuable for commercial cereal formulation and product optimization.

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536. Innovative Education in Higher Institutions: A Tool for Industrial Transformation in Nigeria

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This study examined the effects of innovative education on industrial transformation in Nigeria. The study explored how the three dimensions of innovative education: government expenditure on education, research and development initiative and proportion of trained secondary teachers affect the real sector's contribution to gross domestic product. Secondary data were obtained from the Central Bank of Nigeria, National Bureau of statistics, and World Bank Development indicators using annual time-series covering the periods of 2000 to 2023 controlling for inflation and interest rates. The study employed an autoregressive distributed lag (ARDL) approach to estimate both short- run and long-run relationships among the variables. Preliminary evidence indicated that research and development initiative along with proportion of re-trained secondary schools teachers exerted positive but non-significant effect on industrial transformation, while government education spending showed a negative and insignificant influence. Further, inflation and interest rates contributed to education of industrial expansion. Also, the ARDL bounds test confirmed the existence of along-run equilibrium relationship among the variables, while the error correction mode one revealed that short-run disequilibrium adjusted speedly toward long-run equilibrium across the two major variables of interest. The study concluded that long-term commitments to R&D and teachers up skilling are crucial for industrial productivity and economic transformation in Nigeria. The study therefore, recommends boosting of public investment in education R&D and teachers professional development. It also, urges stronger ties between academia and industry, the growth of innovation network, and favourable macroeconomic policies to drive sustainable industrial growth.

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Keywords: *Innovative education; Government education; Research and development; Industrial transformation.*

537. Re-tooling University Curricula for Food Security and Poverty Reduction: Adapting South East Nigerian Higher Education Institutions for SDG1 and SDG2

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Nigeria has indeed demonstrated commitment to the 2030 Agenda especially as it concern the achievement of SDG 1; no poverty and SDG 2; zero hunger. Inspite of this, poverty and food insecurity has remained a critical challenge to the South East Region of the country. This is driven by Youth unemployment, land fragmentation and over reliance on subsistence agriculture. Higher education institutions (HEIs) are key factors for achieving SDG 1 and SDG 2 through teaching, research and community outreach. Nevertheless, there is limited empirical evidence on how HEIs in South East Nigeria have adapted their curricular to respond to these localized challenges. This study examines curriculum adaptation in South East Higher Education Institutions (Universities and Polytechnics) for the achievement of SDG 1 and SDG 2. Anchored on Human Capital Theory and UNESCO Whole Institution Approach, the study seeks to: 1. assess the extent to which SDG 1 and SDG 2 are integrated into undergraduate and postgraduate curricular in agriculture, social sciences and education. 2. Evaluate pedagogical strategies used to link classroom learning to poverty and food security solutions. 3. Identify institutional, policy, and funding barriers to SDG responsive curriculum reforms. A mixed method case study design will be used across three higher education institutions in the South East of Nigeria; one Federal, one State and one Private. Data will be collected through document analysis of NUC and NBTE Bench Mark Minimum Academic Standards and syllabi, a survey of 200 final year students, 12 key informant interview with Deans and HODs and 4 focused group discussions with lecturers. Quantitative data will be analyzed descriptively while qualitative data will be thematically coded. The study anticipates that SDG 1 and SDG 2 are sparsely integrated, with weak practical components and limited linkage to local food systems. Findings will inform policy recommendation for NUC and NBTE as well as university Senates on curriculum design, including Agripreneurship Modules and Community Based Learning to position graduates as drivers of poverty reduction and food security in Nigeria.

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Keywords: *Curriculum adaptation, Higher education, SDG 1, SDG 2, Food Security, Poverty, Nigeria.*

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