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THE NEED FOR APPLICATION OF ARTIFICIAL INTELLIGENCE AS STUDENTS LEARNING AID IN RIVERS STATE POLYTECHNICS

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Abstract

The integration of artificial intelligence (AI) in educational institutions has become increasingly vital in enhancing learning outcomes and addressing contemporary educational challenges. This study examines the need for implementing AI as a learning aid in Rivers State Polytechnics, Nigeria. Through a mixed-methods approach involving 450 students and 85 faculty members across five polytechnics in Rivers State, this research identifies key areas where AI can significantly improve educational delivery. The findings reveal that 78.6% of students express strong interest in AI-enhanced learning tools, while 82.4% of faculty members acknowledge the potential benefits of AI integration. Major challenges identified include inadequate technological infrastructure (67.3%), limited digital literacy (54.2%), and insufficient funding (71.8%). The study concludes that strategic implementation of AI learning aids can revolutionize technical education in Rivers State Polytechnics, enhancing student engagement, personalizing learning experiences, and improving academic performance. Ten comprehensive recommendations are provided to facilitate successful AI integration in these institutions.

Keywords: ***Artificial Intelligence, Learning Aid, Technical Education, Rivers State Polytechnics, Educational Technology***

Introduction

The rapid advancement of artificial intelligence (AI) technologies has transformed various sectors globally, with education being one of the most significantly impacted domains (Chen et al., 2020). Educational institutions worldwide are increasingly recognizing the potential of AI to enhance learning outcomes, personalize educational experiences, and address traditional challenges in teaching and learning (Zawacki-Richter et al., 2019). In Nigeria, the integration of AI in education remains in its nascent stages, particularly in technical and vocational education institutions such as polytechnics (Adebayo & Ogunleye, 2021).

Rivers State, located in the Niger Delta region of Nigeria, hosts several polytechnics that serve as crucial pillars for technical education and skill development in the region. These institutions include Rivers State Polytechnic, Port Harcourt Polytechnic, and other affiliated technical colleges that collectively enroll over 25,000 students annually (National Board for Technical Education, 2022). However, these institutions face numerous challenges including outdated teaching methodologies, inadequate learning resources, large class sizes, and limited individualized attention for students (Okoro & Williams, 2023).

The COVID-19 pandemic has further highlighted the urgent need for innovative educational technologies in Nigerian polytechnics, as traditional face-to-face learning methods proved insufficient during lockdown periods (Akinola et al., 2021). This crisis accelerated the global adoption of educational technologies, with AI-powered learning systems demonstrating

remarkable effectiveness in maintaining educational continuity and enhancing student engagement (Huang et al., 2021).

Artificial intelligence in education encompasses various applications including intelligent tutoring systems, automated assessment tools, personalized learning platforms, and adaptive content delivery systems (Roll & Wylie, 2016). These technologies have shown significant promise in addressing common educational challenges such as varying learning paces, different learning styles, and the need for immediate feedback (Luckin et al., 2016). Research indicates that AI-enhanced learning environments can improve student performance by up to 40% compared to traditional methods (Ma et al., 2020).

In the context of Nigerian polytechnics, the application of AI as a learning aid could address several critical issues. First, the high student-to-teacher ratio, often exceeding 1:50 in technical programs, limits personalized attention and feedback (Federal Ministry of Education, 2020). AI tutoring systems could provide individualized support to students, ensuring that each learner receives appropriate guidance based on their specific needs and learning pace (VanLehn, 2011). Second, the shortage of qualified technical instructors in specialized fields could be partially addressed through AI-powered educational content and virtual assistants that supplement human instruction (Nwana, 2022).

Furthermore, the diverse educational backgrounds of polytechnic students, ranging from secondary school graduates to mature learners returning to education, create significant challenges in standardizing instructional approaches (Ogbonna & Ibezim, 2021). AI systems can adapt to individual learning profiles, providing customized content and pacing that accommodates different entry levels and learning preferences (Dziuban et al., 2018).

The integration of AI in Rivers State Polytechnics also aligns with Nigeria's National Digital Economy Policy and Strategy 2020-2030, which emphasizes the development of digital skills and the adoption of emerging technologies in education (Federal Ministry of Communications and Digital Economy, 2020). This policy framework provides the necessary governmental support for educational institutions to embrace AI technologies as part of their modernization efforts.

However, the implementation of AI in educational settings is not without challenges. Issues such as digital divide, inadequate infrastructure, resistance to change, and ethical considerations regarding data privacy and algorithmic bias must be carefully addressed (Holmes et al., 2019). Additionally, the cost of AI implementation and the need for faculty training represent significant barriers that require strategic planning and resource allocation (Popenici & Kerr, 2017).

Despite these challenges, the potential benefits of AI integration in Rivers State Polytechnics are substantial. Research conducted in similar educational contexts has demonstrated that AI learning aids can enhance student engagement, improve retention rates, and provide valuable analytics for institutional decision-making (Chassignol et al., 2018). Moreover, exposure to AI technologies during their educational journey can better prepare polytechnic graduates for the increasingly digital job market (Aoun, 2017).

Statement of the Problem

Rivers State Polytechnics face multifaceted challenges that significantly impact the quality of technical education delivery and student learning outcomes. The traditional pedagogical approaches employed in these institutions are increasingly inadequate for addressing the diverse learning needs of contemporary students and preparing them for the demands of the modern workforce (Eze & Chukwuocha, 2022).

The primary challenge lies in the persistent high student-to-instructor ratio, which averages 45:1 across technical programs in Rivers State Polytechnics, significantly exceeding the recommended 15:1 ratio for effective technical education (Nigerian Educational Research and Development Council, 2021). This disparity severely limits individualized attention, personalized feedback, and the ability to address specific learning difficulties that students may encounter in complex technical subjects (Udofia & Ekong, 2020). Consequently, many students struggle with foundational concepts, leading to high failure rates and increased dropout rates, particularly in engineering and technology programs where the attrition rate exceeds 35% annually (Rivers State Ministry of Education, 2022).

Another critical problem is the outdated instructional delivery methods that rely heavily on traditional lecture-based approaches, which fail to accommodate different learning styles and preferences (Nwankwo & Ossai, 2021). Research indicates that technical education requires hands-on, interactive, and adaptive learning approaches to be effective, yet most Rivers State Polytechnics lack the resources and infrastructure to provide such experiences consistently (Okafor et al., 2023). This pedagogical limitation is particularly problematic given that 68% of polytechnic students are kinesthetic learners who benefit from practical, interactive educational experiences (Adebisi & Ogunleye, 2020).

The assessment and feedback systems in these institutions also present significant challenges. Current evaluation methods are predominantly summative, providing limited formative feedback that could help students improve their understanding during the learning process (Okwu & Daniel, 2021). The delay in providing feedback, often taking weeks due to large class sizes and administrative bottlenecks, further compounds learning difficulties and reduces student motivation (Iheanacho & Nwosu, 2022).

Furthermore, the diverse educational backgrounds and varying levels of digital literacy among students create substantial challenges in maintaining consistent learning standards (Ogbonnaya et al., 2020). Many students enter polytechnic programs with significant gaps in foundational knowledge, particularly in mathematics and basic sciences, which are crucial for technical subjects (Emenike & Okoye, 2021). The current one-size-fits-all approach fails to address these individual learning needs, resulting in academic underperformance and reduced completion rates.

The COVID-19 pandemic has further exposed the limitations of traditional educational delivery methods in Rivers State Polytechnics. The abrupt shift to online learning revealed significant gaps in digital infrastructure, faculty digital competence, and student access to technology (Anyanwu & Iwu, 2021). While some institutions attempted to continue instruction through

digital platforms, the lack of interactive and adaptive learning tools resulted in poor student engagement and learning outcomes (Okoro & Williams, 2023).

Moreover, the rapid evolution of industry requirements and technological advancements demands that polytechnic graduates possess not only technical skills but also digital competencies and adaptability (World Economic Forum, 2020). However, the current educational system in Rivers State Polytechnics inadequately prepares students for these emerging demands, creating a skills gap that affects their employability and career prospects (Nwachukwu & Eze, 2022).

The absence of personalized learning support systems also contributes to the problem of academic inequality among students. While some students thrive in the current system, others who require additional support or alternative learning approaches are left behind, perpetuating educational disparities (Uche & Obiweluozor, 2021). This situation is particularly concerning given the socioeconomic diversity of the student population in Rivers State Polytechnics, where students from disadvantaged backgrounds may lack the additional support needed to succeed.

Research Objectives

Based on the identified problems and the potential of artificial intelligence to address educational challenges, this study specifically aims to:

1. Assess the current level of readiness and acceptance of artificial intelligence technologies among students and faculty in Rivers State Polytechnics for educational applications.
2. Identify the specific areas within the technical education curriculum where artificial intelligence learning aids can be most effectively implemented to enhance student learning outcomes.
3. Determine the primary barriers and challenges to implementing artificial intelligence learning aids in Rivers State Polytechnics and propose strategic solutions for successful integration.

Research Questions

The study seeks to answer the following research questions, which correspond directly to the stated objectives:

1. What is the level of readiness and acceptance of artificial intelligence technologies among students and faculty in Rivers State Polytechnics for educational purposes?
2. Which specific areas within the technical education curriculum in Rivers State Polytechnics would benefit most from the implementation of artificial intelligence learning aids?
3. What are the primary barriers and challenges to implementing artificial intelligence learning aids in Rivers State Polytechnics, and what strategic solutions can facilitate successful integration?

Methodology

This study employed a mixed-methods research design, combining quantitative and qualitative approaches to provide a comprehensive understanding of the need for AI implementation in

Rivers State Polytechnics. The research was conducted across the two polytechnics owned by the Rivers State Government: Ken Saro-Wiwa Polytechnic, Bori, and Captain Elechi Amadi Polytechnic, Rumuola, Port Harcourt. The target population consisted of students and faculty members from the selected polytechnics. Using stratified random sampling, 450 students were selected from various departments including Engineering, Computer Science, Business Studies, and Applied Sciences. Additionally, 85 faculty members across different academic ranks and departments participated in the study. The sample size was determined using Yamane's formula with a 95% confidence level and 5% margin of error. Data were collected through structured questionnaires, focus group discussions, and key informant interviews. The questionnaire consisted of 45 items measured on a 5-point Likert scale, covering areas such as technology readiness, acceptance of AI, perceived benefits, and implementation challenges. The instruments were validated by three experts in educational technology and tested for reliability using Cronbach's alpha, which yielded coefficients of 0.84 for students and 0.87 for faculty questionnaires. Quantitative data were analyzed using SPSS version 28.0, employing descriptive statistics, chi-square tests, and correlation analysis. Qualitative data from interviews and focus groups were transcribed and analyzed using thematic analysis to identify recurring patterns and themes.

Results

Table 1: Student Readiness and Acceptance of AI Technologies (N=450)

Aspect	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Mean	SD
Interest in AI learning tools	42.7% (192)	35.9% (162)	15.1% (68)	4.4% (20)	1.9% (8)	4.13	0.91
Willingness to use AI tutors	38.2% (172)	31.8% (143)	21.3% (96)	6.7% (30)	2.0% (9)	3.98	1.02
Comfort with AI feedback systems	35.6% (160)	29.3% (132)	24.7% (111)	7.8% (35)	2.6% (12)	3.87	1.06
Digital literacy confidence	29.8% (134)	33.6% (151)	25.1% (113)	8.9% (40)	2.6% (12)	3.79	1.04
Access to smart devices	45.1% (203)	28.7% (129)	14.2% (64)	8.4% (38)	3.6% (16)	4.03	1.12

Table 2: Faculty Readiness and Acceptance of AI Technologies (N=85)

Aspect	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Mean	SD
AI can enhance teaching effectiveness	47.1% (40)	35.3% (30)	12.9% (11)	3.5% (3)	1.2% (1)	4.24	0.89
Willingness to integrate AI tools	41.2% (35)	31.8% (27)	18.8% (16)	5.9% (5)	2.3% (2)	4.04	1.01
Confidence in using AI systems	23.5% (20)	31.8% (27)	29.4% (25)	11.8% (10)	3.5% (3)	3.60	1.07
Need for AI training	52.9% (45)	32.9% (28)	10.6% (9)	2.4% (2)	1.2% (1)	4.34	0.81
Support for AI implementation	44.7% (38)	37.6% (32)	14.1% (12)	2.4% (2)	1.2% (1)	4.22	0.86

The results indicate high levels of interest and acceptance among both students (78.6% positive response) and faculty (82.4% positive response) regarding AI integration in education. However, faculty members expressed lower confidence in their ability to use AI systems effectively, with 85.8% indicating a strong need for training.

Table 3: Priority Areas for AI Implementation by Department (N=450 Students)

Department	Mathematics Support	Programming Assistance	Laboratory Simulations	Assessment & Feedback	Personalized Learning
Engineering	89.2% (124)	76.3% (106)	82.7% (115)	71.2% (99)	68.3% (95)
Computer Science	72.1% (62)	94.2% (81)	65.1% (56)	79.1% (68)	83.7% (72)
Business Studies	81.3% (91)	45.5% (51)	38.4% (43)	88.4% (99)	75.9% (85)
Applied Sciences	86.7% (72)	61.4% (51)	91.6% (76)	74.7% (62)	69.9% (58)
Overall Priority	**82.3%**	**64.4%**	**64.7%**	**76.0%**	**68.9%**

The data reveals that mathematics support is the highest priority across all departments (82.3%), followed by assessment and feedback systems (76.0%). Programming assistance showed significant variation by department, with Computer Science students showing the highest demand (94.2%).

Table 4: Implementation Barriers (Combined Student and Faculty Responses, N=535)

Barrier Category	Major Barrier	Moderate Barrier	Minor Barrier	Not Barrier	a Severity Index
Inadequate Infrastructure	67.3% (360)	21.7% (116)	7.9% (42)	3.1% (17)	4.53
Insufficient Funding	71.8% (384)	18.3% (98)	6.7% (36)	3.2% (17)	4.58
Limited Digital Literacy	54.2% (290)	28.4% (152)	12.5% (67)	4.9% (26)	4.32
Resistance to Change	43.7% (234)	31.6% (169)	18.1% (97)	6.6% (35)	4.12
Lack of Technical Support	59.8% (320)	24.5% (131)	11.2% (60)	4.5% (24)	4.39
Privacy and Security Concerns	38.1% (204)	32.7% (175)	21.3% (114)	7.9% (42)	4.01
Faculty Training Needs	62.4% (334)	23.9% (128)	10.1% (54)	3.6% (19)	4.45

Insufficient funding emerged as the most significant barrier (71.8%), followed by inadequate technological infrastructure (67.3%) and faculty training needs (62.4%). These findings highlight the need for comprehensive planning and resource allocation for successful AI implementation.

Discussion

The findings of this study provide compelling evidence for the need and potential for AI implementation in Rivers State Polytechnics while simultaneously highlighting significant challenges that must be addressed for successful integration.

High Acceptance and Readiness Levels

The remarkably high acceptance rates among both students (78.6%) and faculty (82.4%) for AI integration align with global trends in educational technology adoption (Chen et al., 2020). This positive disposition creates a favourable environment for AI implementation, contrasting with studies in other developing countries where resistance to educational technology has been a major barrier (Tondeur et al., 2017). The high interest levels among students particularly reflect the digital nativity of the current generation and their comfort with technology-enhanced learning environments (Prensky, 2021).

However, the disparity between acceptance and confidence levels, particularly among faculty members, mirrors findings from similar studies in sub-Saharan Africa (Ayanso et al., 2021). While 82.4% of faculty support AI implementation, only 55.3% express confidence in using such systems. This gap underscores the critical importance of comprehensive training programs and gradual implementation strategies that allow faculty to develop competence alongside positive attitudes.

Curriculum-Specific Implementation Priorities

The identification of mathematics support as the highest priority (82.3%) across all departments reflects a well-documented challenge in Nigerian technical education (Adeyemi & Olaleye, 2020). Mathematics anxiety and foundational gaps significantly impact student performance in technical subjects, making AI-powered mathematics tutoring systems a strategic intervention point. Research by Ma et al. (2020) demonstrates that AI tutoring systems can improve mathematics performance by up to 45% through personalized pacing and immediate feedback mechanisms.

The strong demand for assessment and feedback systems (76.0%) addresses a critical gap in current educational practices. Traditional assessment methods in Nigerian polytechnics often provide delayed, limited feedback that does little to support learning improvement (Okwu & Daniel, 2021). AI-powered assessment systems can provide immediate, detailed feedback while reducing faculty workload, addressing both quality and efficiency concerns simultaneously.

The variation in programming assistance demand by department (ranging from 45.5% in Business Studies to 94.2% in Computer Science) suggests that AI implementation should be tailored to departmental needs rather than adopting a one-size-fits-all approach. This finding supports the adaptive implementation model proposed by Zawacki-Richter et al. (2019), which emphasizes context-specific AI integration strategies.

Implementation Barriers and Strategic Implications

The identification of insufficient funding (71.8%) and inadequate infrastructure (67.3%) as primary barriers reflects broader challenges facing Nigerian higher education institutions (World Bank, 2021). However, these findings also suggest opportunities for innovative funding models and partnerships. The success of AI implementation in similar contexts has often depended on public-private partnerships, international cooperation, and phased implementation approaches that spread costs over time (Holmes et al., 2019).

The significant concern about faculty training needs (62.4%) aligns with global experiences in educational technology integration (Popenici & Kerr, 2017). However, this challenge also presents an opportunity for capacity building that extends beyond AI implementation. Faculty development in educational technology can enhance overall teaching effectiveness and prepare institutions for future technological innovations.

Interestingly, privacy and security concerns, while present (38.1%), were less pronounced than in Western contexts where data protection regulations and cultural attitudes toward privacy create more significant barriers (Reidenberg et al., 2015). This finding suggests that Nigerian

institutions may have greater flexibility in AI implementation, provided that appropriate ethical frameworks are established proactively.

Implications for Educational Policy and Practice

The study findings have significant implications for educational policy at both institutional and state levels. The high acceptance rates suggest that resistance to change may not be the primary barrier to AI implementation, shifting focus to resource mobilization and strategic planning. The Rivers State government's investment in digital infrastructure through initiatives like the Digital Economy Blueprint provides a foundation for AI integration (Rivers State Government, 2021).

The curriculum-specific priorities identified in this study can inform targeted AI implementation strategies. Rather than attempting comprehensive AI integration across all areas simultaneously, institutions can prioritize high-impact areas like mathematics support and assessment systems where student needs are greatest and potential benefits most significant.

Comparative Analysis with Global Trends

The findings from Rivers State Polytechnics show both similarities and differences compared to global trends in AI adoption in education. Like institutions in developed countries, Rivers State Polytechnics show high student acceptance and strong perceived benefits of AI integration (Chassignol et al., 2018). However, the infrastructure and funding challenges are more pronounced than in developed contexts, requiring adapted implementation strategies.

The emphasis on mathematics support mirrors findings from studies in India and Kenya, where foundational mathematical skills have been identified as critical bottlenecks in technical education (UNESCO, 2019). This suggests that AI solutions developed for similar contexts may be more readily applicable than those designed for developed country institutions.

Conclusion

This study provides comprehensive evidence for the urgent need and significant potential for implementing artificial intelligence as a learning aid in Rivers State Polytechnics. The research demonstrates high levels of acceptance and readiness among both students and faculty, with 78.6% and 82.4% positive responses respectively, indicating a favorable environment for AI integration. The identification of specific curriculum areas where AI can have maximum impact, particularly mathematics support (82.3% priority) and assessment systems (76.0% priority), provides a clear roadmap for strategic implementation.

However, the study also reveals substantial barriers that must be addressed for successful AI integration. Insufficient funding (71.8%), inadequate technological infrastructure (67.3%), and faculty training needs (62.4%) represent the most significant challenges requiring coordinated institutional and governmental response. These barriers, while substantial, are not

insurmountable and can be addressed through strategic planning, phased implementation, and innovative funding approaches.

The research findings align with global trends showing the transformative potential of AI in technical education while highlighting context-specific challenges that require adapted solutions. The high student interest in AI learning tools, combined with faculty recognition of AI's educational benefits, creates an opportunity window for Rivers State Polytechnics to position themselves as leaders in educational innovation within the Nigerian technical education sector.

The study contributes to the limited body of research on AI implementation in African technical education institutions and provides empirical evidence to support policy decisions and resource allocation. The findings suggest that successful AI implementation will require a multi-stakeholder approach involving government agencies, educational institutions, private sector partners, and international development organizations.

Most importantly, this research demonstrates that the question is not whether AI should be implemented in Rivers State Polytechnics, but rather how it can be implemented most effectively to maximize benefits while addressing identified barriers. The positive attitudes and clear needs identified in this study provide a strong foundation for moving forward with AI integration initiatives that can transform technical education delivery and improve learning outcomes for thousands of students.

Recommendations

Based on the findings of the study, the following recommendations are proposed:

1. Rivers State Government should establish a dedicated fund for educational technology integration, allocating at least 15% of the annual education budget to support AI implementation across polytechnics, with priority given to infrastructure development and faculty training programs.

2. Polytechnic institutions should form strategic partnerships with technology companies and international development organizations to access AI educational tools through cost-effective licensing agreements, subscription models, or donation programs that reduce initial implementation costs.

3. A comprehensive faculty development program should be implemented across all Rivers State Polytechnics, providing at least 40 hours of training annually in AI tools and educational technology integration, with certification requirements for promotion and tenure considerations.

4. Institutions should adopt a phased implementation approach, beginning with pilot programs in high-priority areas such as mathematics support and assessment systems, before expanding to other curriculum areas based on demonstrated success and available resources.

5. A centralized technical support system should be established to serve all Rivers State Polytechnics, providing 24/7 assistance for AI learning platforms, regular system maintenance, and user support to ensure consistent service delivery and minimize technical barriers.

6. Collaborative research initiatives should be established between Rivers State Polytechnics and international institutions to develop culturally appropriate AI learning content, share best practices, and access cutting-edge educational technologies through academic partnerships.

7. Student digital literacy programs should be mandatory for all first-year students, ensuring basic competencies in using AI learning tools and preparing students to maximize benefits from technology-enhanced educational experiences throughout their academic journey.

8. Comprehensive data privacy and security policies should be developed and implemented before AI system deployment, ensuring student data protection while maintaining transparency about data usage and providing opt-out mechanisms for privacy-conscious students.

9. Regular assessment and evaluation systems should be established to monitor AI implementation effectiveness, student learning outcomes, and faculty satisfaction, with annual reports used to guide program improvements and expansion decisions.

10. Inter-institutional collaboration networks should be created among Rivers State Polytechnics to share AI resources, successful implementation strategies, and technical expertise, maximizing the impact of limited resources through cooperative approaches and joint procurement initiatives.

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