



Artificial intelligence and future of secondary education in delta state: Implications for educational administration



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ABSTRACT

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This study investigated Artificial Intelligence (AI) and the future of secondary education in Delta State, with a particular focus on its implications for educational administration. The purpose of this study was to assess the benefits and challenges of AI in future of secondary education in Delta State. To address this, three research questions and hypotheses were raised and formulated. Using the quantitative research approach of the ex-post-facto research design. Stratified sampling method was used to sample 191 school administrators, representing 40% of the population of 477 government schools in Delta State. A carefully designed, 24-item questionnaire was used to collect information from respondents. Mean, standard deviation, graphical representation, and t-test were employed to answer research questions and formulate hypotheses at a significance level of 0.05. Findings reveal that implementing AI in education offers prospective advantages. Ethical considerations arising from AI integration encompass potential biases in decision-making, among others. We also discovered that effective AI implementation is associated with critical issues. The findings shed light on the perceptions and beliefs of school administrators regarding the integration of Artificial Intelligence (AI) in education. There is an urgent need to develop and implement a comprehensive state-wide plan for the integration of AI in education.

Contribution/ Originality: Secondary education in Delta State, Nigeria, has 21st-century issues that call for urgent attention. Despite the global advancement of AI, the region faces educational disparities. The COVID-19 pandemic emphasizes the importance of technology in sustaining educational continuity. However, the ethical implications of AI and teacher readiness remain a question.

1. INTRODUCTION

Artificial Intelligence (AI) is rapidly reshaping the landscape of education globally, ushering in a transformative era with both unprecedented opportunities and complex challenges for enhancing learning experiences in the 21st century.

Notably, Rajpal, et al. [1] highlight that AI's capacity to personalize learning experiences by tailoring content and assessments to individual student needs and preferences has become a focal point of research. AI algorithms, as discussed in their study, harness the power of big data to analyze students' progress and adapt curricula, accordingly, thus fostering more engaging and customized learning journeys. Furthermore, Baker and Inventado [2] emphasize the remarkable potential of AI to elevate educational outcomes, including achieving higher test

scores and bolstering knowledge retention. Research findings substantiate this promising outlook for improved performance, highlighting AI's role in creating educational opportunities for underserved communities. For instance, [Nkedishu and Okonta \[3\]](#) suggest that AI initiatives can bridge educational disparities by providing online courses, virtual tutoring, and educational resources to students who may lack access to conventional schooling. Taking a global perspective, [Tondeur, et al. \[4\]](#) stressed how AI's influence extends beyond developed nations, permeates emerging economies, and contributes to the worldwide transformation of education, thus highlighting the profound and far-reaching effect of AI on the educational landscape.

2. LITERATURE REVIEW

In recent years, a wave of compelling research has highlighted the immense transformative potential of AI within the realm of educational settings. The advent of AI in education has ushered in a new era of pedagogical innovation, as elucidated by [Smith and Johnson \[5\]](#) in their study, which illuminates the remarkable adaptability of AI systems to cater to the diverse and intricate tapestry of individual learning styles.

Customized learning platforms empowered by artificial intelligence have unveiled remarkable flexibility, deviating significantly from the outmoded one-size-fits-all educational style by offering accurately customized and individualized content [\[6\]](#). This shift towards customized learning experiences not only enhances engagement but also empowers students to chart their educational journeys based on their unique preferences and capabilities.

The research conducted by [Jones \[7\]](#) has unveiled another facet of AI's potential, particularly its capacity to provide real-time feedback. This facet represents nothing short of a paradigm shift in traditional teaching methodologies, as AI systems empower educators with the tools to assess and address student needs on the fly, fostering a dynamic and adaptive learning environment [\[8\]](#).

Consequently, teachers' role is evolving into that of facilitators and mentors, guiding students through their personalized learning trajectories. Amidst the promises of transformation and educational evolution, it is imperative to acknowledge the formidable challenges that accompany the amalgamation of AI in educational contexts. As illuminated by [Garcia and Martinez \[9\]](#), concerns about privacy loom large, as AI inherently requires access to student data for their personalized learning functionalities. Striking a delicate balance between utilizing this data for educational enhancement and safeguarding students' privacy rights is an intricate task that necessitates careful consideration.

The research by [Kumar and Singh \[10\]](#) highlights the existence of access disparities, particularly in regions where technological infrastructure may be lacking. Bridging these disparities to ensure equitable access to AI-enhanced educational resources and opportunities is a pressing concern that must be addressed for AI's benefits to be fully realized.

[Lee \[11\]](#) brings to the forefront the crucial issue of effective teacher training. Preparing educators to harness the potential of AI in their classrooms demands tailored professional development programs that equip them with the necessary skills and knowledge to effectively integrate AI into their teaching practices.

The prospective benefits of AI, in education are multifaceted and have been substantiated by an array of research studies. AI's adaptability to individual learning styles, as demonstrated by [Smith and Johnson \[5\]](#), opens doors to modified learning experiences that engage students more effectively. Moreover, AI-powered platforms, as demonstrated in the work of [Cheng and Lee \[12\]](#), provide personalized content that fosters better understanding and knowledge retention among students. Real-time feedback mechanisms facilitated by AI, as unveiled by [Jones \[7\]](#), revolutionize teaching methodologies, promoting dynamic and responsive classrooms. AI's capacity to bridge educational gaps is evidenced by [Kumar and Singh \[10\]](#) who highlight its potential to provide quality education to underserved populations.

Furthermore, [Lee \[11\]](#) suggests that AI can augment the capabilities of educators, transforming their roles into those of mentors and facilitators, ultimately fostering enriched learning experiences. These findings

collectively underscore the immense promise of AI, from personalized learning to closing educational disparities and empowering educators to better meet the needs of their students.

The ethical implications of integrating AI into education are multifaceted and necessitate vigilant consideration. As highlighted by Taylor and Anderson [13], one pressing concern centres on privacy, with AI's data-driven nature raising questions about the safeguarding of sensitive student information. Similarly, Martinez and Ramirez [14] accentuate the prominence of addressing biases embedded within AI algorithms, as they can inadvertently perpetuate inequalities, potentially disadvantaging certain student groups. Accountability and transparency in AI decision-making, as advocated by Johnson and Smith [15], are also paramount to ensuring fair treatment and comprehending the reasoning behind AI-generated outcomes. The phenomenon of digital divide, as highlighted in the study by Robinson, et al. [16], emphasizes the ethical concerns about AI's potential to impair existing disparities in access to educational technology. Furthermore, the changing dynamics of the teacher-student relationship due to AI's increased role in instruction, as observed by Lee and Kim [17], introduces ethical questions about the balance between technological assistance and human interaction in education. Consequently, addressing these ethical dimensions is imperative to harness AI's potential while upholding the principles of fairness, privacy, and accessibility in education.

AI implementation in education presents a multitude of challenges that warrant a thorough examination. Anderson and White [18] noted that a lack of infrastructure and technology access in certain regions can hinder the equitable deployment of AI-based educational tools, exacerbating disparities in educational opportunities. Additionally, the ethical dimensions of AI, including data privacy concerns highlighted by Smith and Garcia [19] and the impending algorithmic bias highlighted by Martinez and Ramirez [14], demand careful consideration to ensure that AI operates ethically and fairly. Substantial teacher training and professional growth in AI integration are highly needed, as emphasized by Lee [20].

This is another pressing challenge, as educators must acquire the skills and knowledge to effectively utilize AI in pedagogical contexts. According to Selwyn [21], the complexities involved in AI implementation, mingled with the inherent confrontation with change, can present significant hurdles within educational institutions. The cost associated with adopting AI technologies, as discussed by Taylor and Clark [22], often strains educational budgets, warranting a thoughtful allocation of resources.

Navigating these challenges is imperative to harnessing the transformative latent of AI in education while upholding principles of equity, ethics, and effective pedagogy.

In Delta State, the integration of AI technologies into secondary education signifies a significant stride towards a more promising educational landscape. As the global trajectory veers increasingly towards a digitally driven future, it becomes not only beneficial but imperative to delve into the transformative role that AI can play in shaping future of education within this region.

The Nigerian educational context, and specifically Delta State, presents a unique set of challenges encompassing structural limitations and pedagogical hurdles. The inclusion of AI emerges as a beacon of hope, holding the potential to tackle and ameliorate some of these multifaceted issues. Delta State, like many regions in Nigeria, seems to grapple with inadequate infrastructure, limited access to quality educational resources, and a curriculum that may not be optimally aligned with the demands of the 21st century. The integration of AI can pave the way for innovative solutions that have the capacity to transcend these challenges. AI-powered adaptive learning systems can cater to the diverse learning needs and styles of students, offering personalized educational experiences that resonate with individual aptitudes and preferences. Moreover, AI can contribute to filling gaps in access to quality education, particularly in remote or underserved areas, by providing virtual tutoring, online courses, and educational resources that transcend geographical barriers. AI support can profoundly enhance the role of educators in Delta State. AI-driven analytics can provide teachers with valuable insights into student progress, allowing for

timely interventions and tailored instruction. This transformation can empower educators to become mentors and facilitators, guiding students through personalized learning journeys.

However, the promise of AI is abundant; it must be accompanied by careful considerations of the principled and practical dimensions of implementation. Privacy, data security, and ensuring justifiable access to AI-enabled resources are critical aspects that demand meticulous attention.

2.1. Statement of the Problem

In Nigeria, secondary education in Delta State is facing complex challenges that demand advanced solutions to meet the developing demands of the 21st century. With the universal progression of expertise and the cumulative integration of AI in various sectors, including education, there is a persistent need to assess the latent benefits and challenges of realizing AI-driven creativity in secondary education, particularly, in Delta State. Like many states in Nigeria, Delta State might contend with scarce infrastructure, limited access to quality education, and a prospectus that may not completely equip students with the skills essential for an increasingly digital and globalized world. COVID-19 pandemic highlighted the significance of technology in guaranteeing continuity of education, emphasizing the perseverance of addressing these challenges.

While AI holds promise for addressing some of these educational issues, there are momentous concerns and obstacles that require systematic investigation. Questions arise regarding the ethical implications of AI in education, readiness of teachers and institutions to adopt AI-driven technologies, and the potential disparities in access to AI-enabled educational resources among students in urban and rural areas of Delta State. To address these challenges and opportunities, it is imperative to examine AI and the future of secondary education in Delta State.

2.2. Research Questions

The following questions were raised:

1. What are the prospective advantages of implementing AI in the field of education?
2. What ethical considerations arise from the integration of AI technologies?
3. What are the critical issues associated with the effective implementation of AI?

2.3. Hypotheses

The following hypotheses were formulated:

1. Prospective advantages of implementing AI in the field of education do not significantly differ between urban and rural school administrators.
2. Ethical considerations that arise from the integration of AI technologies do not significantly differ between urban and rural school administrators.
3. Critical issues associated with the effective implementation of AI do not significantly differ between urban and rural school administrators.

3. METHODS

3.1. Design

This study employed a quantitative research approach with an ex-post-facto research design. No variables were manipulated or controlled; rather, the researchers retrospectively analyzed data that had already been collected to determine if there were relationships or differences between variables.

3.2. Population, Sample and Sampling Method

The study population was 477 government secondary schools' principals in Delta State. The study actively involved 191 school administrators from public secondary schools in Delta State, Nigeria. We carefully selected them using a stratified sampling approach to ensure the diverse representation of the entire population of government secondary schools in Delta State. This process involves dividing the population into strata, and then selecting samples at random from each stratum in the same ratio to its size. We collected the data from Ministry of Basic and Secondary Education in August 2023.

3.3. Instrument

A carefully designed, 24-item structured questionnaire was used to collect and quantify respondents' views on AI's expected benefits, ethical implications, and critical implementation challenges. The questionnaire was structured on four-point scale of Strongly Agree, Agree, Disagree and Strongly Disagree which is valued at 4-1.

3.4. Validity and Reliability

The instrument was subjected to experts who ensured that the content measured extensively what it intended to measure. Thereafter, a careful pilot study was conducted using Cronbach's alpha and a coefficient of .87 was obtained, signifying the instrument's internal consistency.

3.5. Method of Data Analysis

Data analysis was carried out using mean, standard deviation, and graphical representation for the research questions. Hypotheses were tested with a t-test at a significance level of .05.

4. RESULTS

Research Question 1: What are the prospective advantages of implementing AI in the field of education?

Table 1. Mean and SD on prospective advantages of implementing AI in the field of education.

S/N	Prospective advantages of implementing AI in the field of education	Mean	SD	Remark
1	Enrich students' learning.	3.42	0.66	+
2	Improve student academic performance.	3.47	0.66	+
3	Offer modified learning experiences.	3.35	0.65	+
4	Enriched learning experiences of students.	3.32	0.68	+
5	Help bridge educational disparities.	3.40	0.68	+
6	Address the needs of diverse learners effectively.	3.34	0.67	+
7	Promoting dynamic classrooms.	3.35	0.73	+
8	Revolutionize teaching methodologies.	3.35	0.75	+

Note: + = Agree; - = Disagree benchmark = 2.50.
Source: Fieldwork.

Table 1 revealed mean and SD of the prospective advantages of implementing AI in the field of education. The result showed that respondents agree on enriching students' learning, improving student academic performance, offering modified learning experiences, enriching the learning experiences of students, helping bridge educational disparities, addressing the needs of diverse learners effectively, promoting dynamic classrooms, and revolutionizing teaching methodologies with ratings of 3.42, 3.47, 3.35, 3.32, 3.40, 3.34, 3.35, and 3.35 respectively. Thus, enriching students' learning, improving student academic performance, offering modified learning experiences, enriching the learning experiences of students, helping bridge educational disparities, effectively addressing the needs of diverse learners, promoting dynamic classrooms, and revolutionizing teaching methodologies were prospective advantages of implementing AI in the field of education. See Figure 1.

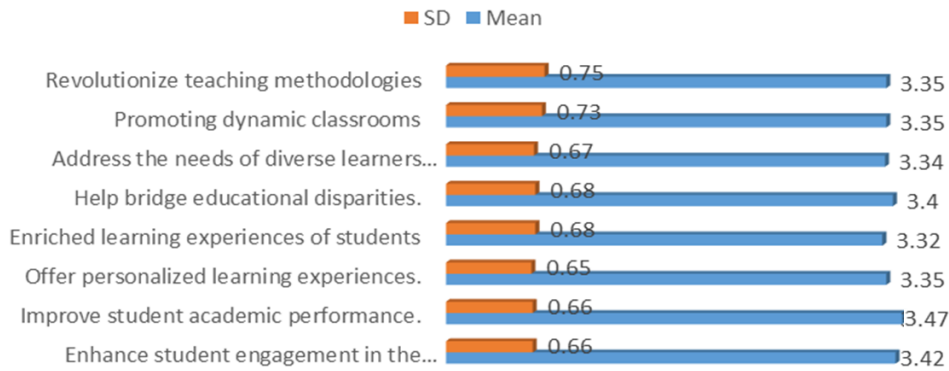


Figure 1. Prospective advantages of implementing AI in the field of education.

Research Question 2: What ethical considerations arise from the integration of AI technologies?

Table 2. Mean and SD on ethical considerations arise from the integration of AI technologies.

S/N	Ethical considerations arise from the integration of AI technologies	Mean	SD	Remark
1	Introduce biases in educational decision-making.	3.08	0.85	+
2	Ethical AI practices can be effectively enforced.	3.08	0.82	+
3	Disparities in access to AI-driven educational tools.	3.10	0.83	+
4	AI can promote fair and unbiased student assessments.	3.31	0.70	+
5	AI promote educational equality.	3.35	0.69	+
6	AI can enhance transparency in educational decision-making.	3.11	0.81	+
7	The potential impact of AI on teacher roles and employment.	3.20	0.70	+

Note: + = Agree; - = Disagree benchmark = 2.50.
 Source: Fieldwork.

Table 2 revealed mean and SD of ethical considerations arising from the integration of AI technologies. The result showed that respondents agree on introducing biases in educational decision-making, ethical AI practices can be effectively enforced, disparities in access to AI-driven educational tools, AI can promote fair and unbiased student assessments, AI promotes educational equality, AI can enhance transparency in educational decision-making, and the potential impact of AI on teacher roles and employment, with mean scores of 3.08, 3.08, 3.10, 3.31, 3.35, 3.11, and 3.20. Thus, ethical considerations that would arise from the integration of AI technologies include introduction of biases in educational decision-making, disparities in access to AI-driven educational tools, promoting fair and unbiased student assessments, promoting educational equity, and enhancing transparency in educational decision-making, and potential impact of AI on teacher roles and employment. See Figure 2.

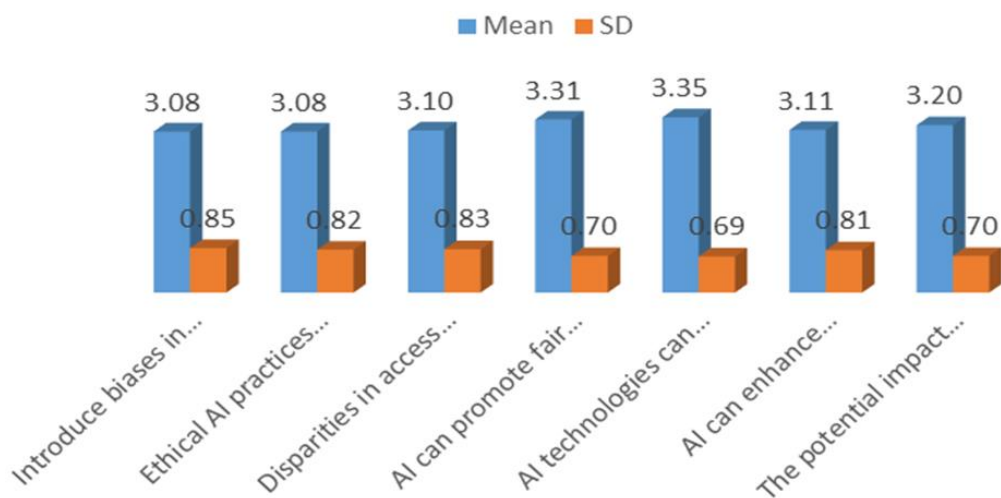


Figure 2. Ethical considerations arise from the integration of AI technologies.

Research Question 3: What are the critical issues associated with the effective implementation of AI?

Table 3. Mean and SD on critical issues associated with the effective implementation of AI.

S/N	Critical issues associated with the effective implementation of AI	Mean	SD	Remark
1	Infrastructure limitations	3.30	0.71	+
2	Ethical dimensions of AI	3.07	0.82	+
3	Cost associated with adopting AI technologies	3.21	0.76	+
4	Some teachers are not technological advanced to use AI	3.19	0.74	+
5	Data privacy	3.11	0.81	+
6	Affect teacher job roles significantly	3.20	0.74	+
7	Teachers' assertiveness towards AI	3.27	0.73	+
8	Resistance to AI adoption in educational settings	3.14	0.81	+
9	Teachers' preparation to adopt AI	3.22	0.76	+

Note: + = Agree; - = Disagree benchmark = 2.50.
 Source: Fieldwork.

Table 3 shows mean and SD of critical issues associated with the effective implementation of AI. Results show that respondents agree with mean of 3.30, 3.07, 3.21, 3.19, 3.11, 3.20, 3.27, 3.14, and 3.22 on infrastructure limitations, ethical dimensions of AI, cost associated with adopting AI technologies, some teachers are not technologically advanced to use AI, data privacy, affect teacher job roles significantly, teachers' assertiveness towards AI, resistance to AI adoption in educational settings, and teachers' preparation to adopt AI. Thus, critical issues associated with the effective implementation of AI include infrastructure limitations, ethical dimensions of AI, cost associated with adopting AI technologies, the fact that some teachers are not technologically advanced enough to use AI, data privacy, which affects teacher job roles significantly, teachers' assertiveness towards AI, resistance to AI adoption in educational settings, and teachers' preparation to adopt AI. See Figure 3.

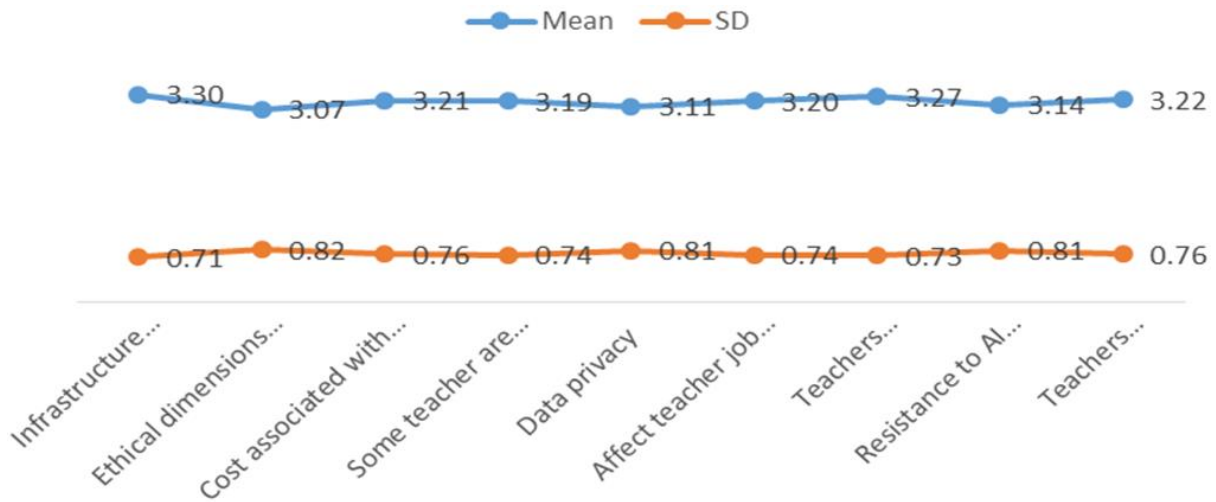


Figure 3. Critical issues associated with the effective implementation of AI.

Hypothesis 1: Prospective advantages of implementing AI in the field of education does not significantly differ between urban and rural school administrators.

Table 4. t-test summary between urban and rural school administrators.

Variables	N	Mean	SD	DF	t-cal.	t-crit.	Remark
Urban respondents	112	3.51	0.40	189	5.51	±1.96	H ₀ rejected
Rural respondents	79	3.15	0.50				

Table 4 shows t-test summary between urban and rural school administrators. The result on the table revealed that school administrators from urban areas were 112 with mean of 3.51, SD=40 while school administrators from

rural area were 79 with mean of 3.15, SD=50. t-cal. was 5.51 and t-crit. was ± 1.96 with df of 189. Since the calculated t-cal. value of 5.51 was higher than t-crit. value of ± 1.96 at significant level of 0.05, the null hypothesis was rejected. It therefore implies that prospective advantages of implementing AI in the field of education significantly differ between urban and rural school administrators.

Hypothesis 2: Ethical considerations that arise from the integration of AI technologies do not significantly differ between urban and rural school administrators.

Table 5. t-test summary between urban and rural school administrators.

Variables	N	Mean	SD	DF	t-cal.	t-crit.	Remark
Urban respondents	112	3.24	0.37	189	1.60	± 1.96	H ₀ retained
Rural respondents	79	3.13	0.51				

Table 5 shows t-test summary between urban and rural school administrators. The result on the table revealed that school administrators from urban area were 112 with mean of 3.24, SD=37 while school administrators from rural area were 79 with mean of 3.13, SD=35.1. t-cal. was 1.60 and t-crit. was ± 1.96 with df of 189. Since the calculated t-cal. value of 1.60 was less than t-crit. value of ± 1.96 at significant level of 0.05, the null hypothesis was retained. Thus, ethical considerations that arise from the integration of AI technologies do not significantly differ between urban and rural school administrators.

Hypothesis 3: Critical issues associated with the effective implementation of AI do not significantly differ between urban and rural school administrators.

Table 6. t-test summary between urban and rural school administrators.

Variables	N	Mean	SD	DF	t-cal.	t-crit.	Remark
Urban respondents	112	3.29	0.49	189	3.91	± 1.96	H ₀ rejected
Rural respondents	79	3.03	0.39				

Table 6 shows t-test summary between urban and rural school administrators. The result on the table revealed that school administrators from urban area were 112 with mean of 3.29, SD=49 while school administrators from rural area were 79 with mean of 3.03, SD=39. t-cal. was 3.91 and t-crit. was ± 1.96 with df of 189. Since the calculated t-cal. value of 3.91 was higher than t-crit. value of ± 1.96 at significant level of 0.05, the null hypothesis was rejected. Thus, critical issues associated with the effective implementation of AI are significantly differing between urban and rural school administrators.

5. DISCUSSION

The findings of this study have revealed several prospective advantages associated with the implementation of Artificial Intelligence (AI) in the field of education. These advantages include enhanced student engagement in the learning process, improved academic performance, the provision of modified learning experiences, enriched overall learning experiences for students, the bridging of educational disparities, effective addressing of the needs of diverse learners, the promotion of dynamic classrooms, and the revolutionization of teaching methodologies. The study's hypothesis testing revealed that there is no significant difference in the potential benefits of implementing AI in education between urban and rural school administrators in Delta State. The finding that these prospective advantages of AI in education exhibit a level of uniformity between urban and rural school administrators in Delta State can be attributed to several contributing factors. Firstly, the identified potential benefits, such as enhanced academic performance, personalized learning, and increased student engagement, may be perceived as advantages that hold universal applicability, transcending geographical boundaries. Secondly, the establishment of state-wide or national educational policies and initiatives to uniformly leverage the benefits of AI in education across diverse

educational setting is plausible. Thirdly, comprehensive training and awareness programs concerning the advantages of AI in education may have been widely disseminated, ensuring that both urban and rural administrators share a common understanding of these potential benefits. Lastly, the sample of administrators surveyed in the study may have been representative of the broader population, capturing a consensus on the prospective advantages of AI in education that applies universally within Delta State. This finding aligns with prior research in the field, reinforcing the multifaceted promise of AI in education. Previous studies have highlighted AI's adaptability to individual learning styles, as demonstrated by [Smith and Johnson \[5\]](#), which opens avenues to modified learning experiences that effectively engage students. Additionally, AI-powered platforms, as demonstrated in the study by [Pane, et al. \[23\]](#), provide personalized content that fosters improved comprehension and knowledge retention among students. The integration of real-time feedback mechanisms facilitated by AI systems, as unveiled by [Jones \[7\]](#), represents a revolutionary step in teaching methodologies, promoting dynamic and responsive classrooms. The potential for AI to bridge educational gaps has been underlined by [Kumar and Singh \[10\]](#), emphasizing its capacity to provide quality education to underserved populations. Additionally, [Lee \[11\]](#)'s research suggests that AI can enhance educators' capabilities by transforming them into mentors and facilitators, thereby fostering enriched learning experiences. Collectively, these findings underscore the substantial promise of AI in education, encompassing personalized learning, the amelioration of educational disparities, and the empowerment of educators to better cater to the diverse needs of their students.

Ethical considerations arising from the integration of AI technologies into education encompass several key aspects, as revealed by the finding. These considerations include the potential introduction of biases in educational decision-making, disparities in access to AI-driven educational tools, the promotion of fair and unbiased student assessments, the enhancement of educational equity, the increased transparency in educational decision-making processes, and the potential impact of AI on teacher roles and employment within the educational landscape. Notably, the hypothesis testing conducted in the study indicated that these ethical considerations do not significantly differ between urban and rural school administrators in Delta State. Several factors contribute to the findings that ethical considerations related to the integration of AI technologies do not significantly differ between urban and rural school administrators in Delta State. Firstly, it is plausible that overarching ethical guidelines and policies have been established at the state or national level that are uniformly applicable to educational institutions, irrespective of their geographical location. Secondly, the ethical concerns identified, such as biases in decision-making, disparities in access, and the imperative for transparency, may be recognized as fundamental issues that affect education at a broader scale, transcending distinctions between urban and rural contexts. Additionally, awareness and training programs that focus on the ethical use of AI may have been widely disseminated, ensuring that both urban and rural administrators possess a similar understanding of the ethical implications associated with AI integration in education. Lastly, it is conceivable that the sample of administrators surveyed in the study accurately reflects the broader population, thereby indicating the consistency of ethical considerations across different school settings.

This finding aligns with prior research in the field, as it highlights the multifaceted nature of ethical concerns in AI integration within education. Prior studies have highlighted the significance of privacy concerns, as indicated by [Taylor and Anderson \[13\]](#), wherein the data-driven nature of AI raises questions regarding the safeguarding of sensitive student information. Furthermore, [Martinez and Ramirez \[14\]](#) emphasized the importance of addressing biases inherent in AI algorithms, as these biases can inadvertently perpetuate inequalities, potentially disadvantaging specific student groups. The need for transparency and accountability in AI decision-making, as advocated by [Johnson and Smith \[15\]](#), is also paramount to ensuring equitable treatment and gaining a comprehensive understanding of the rationale behind AI-generated outcomes. The notion of the digital divide, as expounded in the work of [Warschauer and Matuchniak \[24\]](#), stresses the ethical quandary of AI potentially expanding the gap in access to educational technology resources. Moreover, the shifting dynamics of the teacher-

student relationship due to AI's expanding role in instruction, as observed by Lee and Kim [17], introduces ethical questions concerning the balance between technological assistance and human interaction in the educational sphere.

It has been established that several critical issues are associated with the effective implementation of Artificial Intelligence (AI) in education. These issues encompass infrastructure limitations, ethical dimensions of AI, the cost associated with adopting AI technologies, challenges related to teachers' technological proficiency, concerns about data privacy, significant effects on teacher job roles, teachers' assertiveness towards AI, resistance to AI adoption within educational settings, and the preparedness of teachers to adopt AI. Notably, the hypothesis testing revealed that these critical issues significantly differ between urban and rural school administrators in Delta State. This finding suggests a level of uniformity in the challenges faced by educational institutions across diverse geographic settings within Delta State. This uniformity may be attributed to consistent state-wide policies, equitable resource allocation, standardized teacher training programs, and a shared experience of common challenges such as infrastructure limitations, cost considerations, data privacy concerns, and teacher readiness. It highlights that Delta State's educational landscape, concerning AI integration, is characterized by common obstacles that transcend urban and rural boundaries. Therefore, it highlights the need for comprehensive and inclusive strategies to effectively address these challenges. This finding aligns with the conclusions drawn by Anderson and White [18], who observed that a lack of infrastructure and limited technology access in specific regions can hinder the equitable deployment of AI-based educational tools, leading to disparities in educational opportunities. Furthermore, it emphasises the importance of addressing the ethical dimensions of AI, including data privacy concerns highlighted by Smith and Garcia [19] and the potential for algorithmic bias stressed by Martinez and Ramirez [14] to ensure the ethical and fair operation of AI systems. The need for substantial teacher training and professional development in AI integration, as emphasized by Lee [20], is identified as a crucial challenge, as educators must acquire the necessary skills and knowledge for effective AI utilization in pedagogical contexts. Moreover, it admits that the complex nature of AI implementation and the innate resistance to change, as examined in the study by Howard and Mozejko [25], can present substantial challenges within educational institutions. Lastly, the strain on educational budgets due to the cost associated with adopting AI technologies, as discussed by Taylor and Clark [22], highlights the importance of judicious resource allocation.

6. CONCLUSION

In conclusion, the findings of this study shed light on the perceptions and beliefs of school administrators in Delta State secondary schools regarding the integration of Artificial Intelligence (AI) in education. Notably, administrators across both urban and rural settings unanimously recognize the prospective advantages of AI, including enhanced student engagement, improved academic performance, modified learning experiences, enriched educational outcomes, bridging educational disparities, effective support for diverse learners, dynamic classrooms, and the transformation of teaching methodologies. Additionally, ethical considerations pertaining to AI integration revolve around issues of fairness, transparency, access, and the potential impact on teacher roles and employment. Importantly, this research has shown that these perceived advantages and ethical considerations are consistent across urban and rural school administrators, suggesting a shared understanding and consensus on the potential and challenges of AI in education. These findings underscore the importance of inclusive and equitable strategies for the effective and ethical integration of AI technologies into the educational landscape of Delta State.

6.1. Implications for Educational Administration

The implications of these findings for educational administration in Delta State are profound, signaling the need for a strategic and inclusive approach to harnessing the potential of Artificial Intelligence (AI) in education. Educational administrators must prioritize equitable resource allocation, focusing on technology infrastructure development, to bridge urban-rural divides. Furthermore, comprehensive professional development programs for

teachers and administrators should be a cornerstone of administrative initiatives, ensuring that educators are well-prepared for AI integration. Administrators play a pivotal role in enforcing ethical guidelines to address biases, safeguard privacy, promote fairness, and maintain transparency in AI-driven educational practices. Collaborative efforts and advocacy are essential for building awareness and acceptance of AI technologies. By embracing these implications, educational administration can steer Delta State's education system toward a future where AI contributes to improved student outcomes, regardless of geographic location.

6.2. Recommendations

The study's findings prompt educational authorities, policymakers, and stakeholders in Delta State to consider the following recommendations:

1. Develop and implement a comprehensive state-wide plan for integration of AI in education. This strategy should outline clear objectives, guidelines, and action plans to ensure a uniform and equitable adoption of AI technologies in both urban and rural schools.
2. Provide targeted professional development and training programs for teachers and administrators to enhance their technological skills and prepare them for the effective use of AI in education. These programs should be accessible to educators across all regions of Delta State.
3. Establish and disseminate clear ethical guidelines for the responsible use of AI in educational settings. These guidelines should address issues of bias, privacy, transparency, and fairness to ensure that AI technologies benefit all students equitably.
4. Invest in improving technology infrastructure, particularly in rural areas, to address infrastructure limitations and ensure that all schools have adequate access to AI-driven educational tools and resources.
5. Launch awareness campaigns and advocacy efforts to inform stakeholders, including parents, students, and the wider community, about the potential benefits and ethical considerations of AI in education. Encourage dialogue and collaboration to foster acceptance and understanding of AI technologies.

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Institutional Review Board Statement: The Ethical Committee of the Department of Educational Management and Foundations, Faculty of Education, Delta State University, Abraka, Nigeria has granted approval for this study on 16 June 2023 (Ref. No. DEL/FOE/EMF/0127).

Transparency: The authors state that the manuscript is honest, truthful, and transparent, that no key aspects of the investigation have been omitted, and that any differences from the study as planned have been clarified. This study followed all writing ethics.

Competing Interests: The authors declare that they have no competing interests.

Authors' Contributions: Both authors contributed equally to the conception and design of the study. Both authors have read and agreed to the published version of the manuscript.

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