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# Leveraging Artificial Intelligence to Enhance Teaching, Learning Outcomes, and Institutional Development in Vocational And Technical Education for Innovation and Job Creation in Nigeria.

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**Abstract**
*This study examined leveraging Artificial Intelligence to enhance teaching, learning outcomes and institutional development in Vocational and Technical Education for innovation and job creation. The population of the study comprised three categories of stakeholders within selected Vocational and Technical Education institutions in Lagos State: students enrolled in technical programmes, teachers involved in instructional delivery, and administrators responsible for policy implementation and institutional management. A sample size of 120 respondents was selected using a stratified random sampling technique. The population was first stratified into three groups: students, teachers, and administrators. Thereafter, proportionate sampling was applied to select 60 students, 40 teachers, and 20 administrators across the selected institutions. Within each institution, respondents were randomly selected from updated institutional lists to ensure equal representation and minimise selection bias. Data were collected using a structured questionnaire, validated by experts for content accuracy. Reliability of the instrument was confirmed with a Cronbach's alpha of 0.87, showing internal consistency. The data were analysed using descriptive statistics (frequency, percentage, mean, and standard deviation) and inferential statistics (one-way ANOVA and post hoc test).Descriptive results indicated that respondents agreed AI had a positive effect on teaching, with a grand mean of 3.73, and on student learning outcomes, with a grand mean of 3.77. Institutional challenges were also recognized, with a mean of 3.58, pointing to barriers such as limited infrastructure and weak policy support. Inferential analysis tested the null hypotheses at the 0.05 level of significance ($a = 0.05$). Results revealed statistically significant differences among groups for teaching ($F(2,117) = 4.27$, $p = 0.016$, $p < 0.05$), learning outcomes ($F(2,117) = 4.82$, $p = 0.010$, $p < 0.05$), and institutional challenges ($F(2,117) = 3.92$, $p = 0.023$, $p < 0.05$). Post hoc comparisons showed that students perceived greater benefits from AI, while administrators expressed stronger concerns about institutional challenges. The study concluded that AI is beginning to improve vocational and technical education but with uneven adoption. It is recommended that government and institutions strengthen digital infrastructure, provide continuous teacher training, and design clear policies to maximize AI's potential in education.*

**Keywords:** Artificial Intelligence, Vocational and Technical Education

## 1. Introduction

Artificial Intelligence (AI) is increasingly acknowledged as a defining technology of the 21st century, with transformative potential across multiple sectors, including Technical and Vocational Education and Training (TVET). The integration of AI into vocational training is not merely about modernising teaching methods; it is about reimagining how education can become a catalyst for innovation, employability, and sustainable economic growth. Recent scholarship confirms that AI now shapes how vocational programmes are designed, delivered, and assessed, thereby ensuring they remain relevant to the evolving needs of industry and society (Ran & Han, 2023; Shen et al., 2024).

The importance of this transformation is underscored by global aspirations such as the Sustainable Development Goals (SDGs), which emphasise poverty alleviation, decent work, and inclusive growth by 2030 (Odo, 2023; Ojeaga & Dumbiri, 2023; Sutikno, 2024). Within this context, AI offers practical pathways for scaling quality education and training to marginalised populations. Javaid et al. (2023) demonstrate that AI-driven platforms can democratise learning access through cost-effective, flexible, and widely accessible solutions. At the same time, Artificial Intelligence supports job matching, enhances employability, and fosters lifelong skill development, all of which are critical drivers of innovation and productivity in the contemporary labour market (Garlinska et al., 2023).

Vocational and technical education itself remains central to equipping individuals with competencies necessary for innovation-led economies. Studies by Fortuna, Prasetya, Luis, et al. (2024), Fortuna, Prasetya, Samala, et al. (2024), Prasetya et al. (2023), and Wulansari et al. (2024) highlight TVET's role in promoting sustainable development and inclusive growth. AI enhances this role by ensuring that training systems are more adaptive, personalised, and industry-responsive. According to Vinuesa et al. (2020), AI strengthens educational quality and inclusiveness, creating opportunities for learners who might otherwise be excluded. Adel (2024) further situates AI as a critical bridge between Industry 4.0 and

Industry 5.0, enabling vocational education to move beyond traditional training into spaces of creativity, adaptability, and innovation.

The personalisation of learning is particularly significant for innovation. Bhutoria (2022), in a comparative study across the United States, China, and India, demonstrates how AI-enabled educational systems tailor learning experiences to diverse needs, enabling learners to develop relevant skills at their own pace. Real-time feedback and adaptive learning pathways, made possible by AI, enhance learners' confidence, engagement, and outcomes. Similarly, Prasetya, Fortuna, Samala, et al. (2024) found that technology-mediated experiences improve student attention, material relevance, and satisfaction factors that not only raise learning quality but also stimulate creativity and entrepreneurial thinking.

From a systemic perspective, AI contributes to aligning vocational education with the demands of the labour market, which is essential for job creation. Renz and Hilbig (2021) note that curricula can be continuously updated through AI insights to reflect industry changes, ensuring that skills training remains future-oriented. Javaid et al. (2023) further link AI adoption in vocational training to the achievement of SDGs 4 and 8, while Mhlanga (2023) stresses its role in digital transformation and sustainable educational infrastructure. By embedding AI into TVET, nations can create a pipeline of skilled workers capable of innovating within new industries and responding flexibly to technological shifts.

To fully leverage these opportunities, stakeholders and policymakers require a robust understanding of the emerging research landscape. Bibliometric studies provide such insights by mapping prevailing themes, identifying key contributions, and revealing knowledge gaps (Renz & Hilbig, 2021). Evidence from Muskhir et al. (2024), Prasetya, Fortuna, Jalinus, et al. (2024), and Rahim et al. (2024) confirms that strategic investments in AI-driven vocational education are essential for preparing adaptable, creative, and employable workforces. Ultimately, aligning TVET with AI is not just about education reform; it is about unlocking innovation potential, accelerating job creation, and building resilient economies for the future.

## 2. Statement of the Problem

Nigeria has continued to grapple with serious challenges in her education sector, particularly in vocational and technical education where skills acquisition is central to national development. Despite the government's investments and reforms, the system still struggles with outdated teaching methods, poor learning outcomes, and a widening gap between training and the demands of the Fourth Industrial Revolution. The rise of Artificial Intelligence (AI) offers fresh opportunities to transform the way teaching and learning are carried out, providing smart tools that can personalize learning, improve efficiency, and enhance problem-solving skills among students. However, the actual extent to which AI has been leveraged in Nigerian vocational and technical education remains largely underexplored. Students, teachers, and administrators hold different experiences and perceptions, but these have not been systematically compared to show whether AI has really improved instruction, learning outcomes, or faced institutional barriers. This research is therefore necessitated to leverage Artificial Intelligence in enhancing teaching, learning outcomes, and innovation in Vocational and Technical Education and to provide evidence-based conclusions on how technology can be maximized for educational reform.

## 3. Purpose of the Study

The purpose of the study is to:

i. Determine the extent to which Artificial Intelligence has improved teaching in Vocational and Technical Education institutions in Lagos State.
ii. Examine the extent to which Artificial Intelligence has improved student learning outcomes in Vocational and Technical Education in Lagos State.
iii. ·Identify the major institutional challenges associated with the integration of Artificial Intelligence in Vocational and Technical Education in Lagos State.

## 4. Research Questions

The following research questions guided this study:

i. To what extent has Artificial Intelligence improved teaching in Vocational and Technical Education institutions in Lagos State?
ii. ·To what extent has Artificial Intelligence improved student learning outcomes in Vocational and Technical Education in Lagos State?
iii. What are the major institutional challenges associated with integrating Artificial Intelligence into Vocational and Technical Education in Lagos State?

## 5. Hypotheses

The following hypotheses guided this study:

**$H_{01}$:** There is no significant difference in the perceptions of students, teachers, and administrators on the extent to which Artificial Intelligence improves teaching in vocational and technical education.

**$H_{02}$:** There is no significant difference in the perceptions of students, teachers, and administrators on the extent to which Artificial Intelligence improves student learning outcomes in vocational and technical education.

**$H_{03}$:** There is no significant difference in the perceptions of students, teachers, and administrators on the major institutional challenges faced in integrating Artificial Intelligence into vocational and technical education.

## 6. Methodology

This study adopted a descriptive survey research design to leverage Artificial Intelligence to enhance teaching, learning outcomes and institutional development in Vocational and Technical Education for innovation and job creation in Nigeria. The study area was Lagos State, selected due to its prominence as Nigeria's leading hub for industrial development, technological innovation, and technical education. The state hosts key institutions such as Yaba College of Technology (YABATECH), Lagos State Polytechnic (LASPOTECH), the Federal College of Education (Technical), Akoka, and technical colleges under the Lagos State Technical and Vocational Education Board (LASTVEB), all of which are actively engaged in vocational and technical training and are progressively integrating digital and AI-driven instructional approaches.

The population of the study comprised three categories of stakeholders within selected Vocational and Technical Education institutions in Lagos State: students enrolled in technical programmes, teachers involved in instructional delivery, and administrators responsible for policy implementation and institutional management.

A sample size of 120 respondents was selected using a stratified random sampling technique. The population was first stratified into three groups: students, teachers, and administrators. Thereafter, proportionate sampling was applied to select 60 students, 40 teachers, and 20 administrators across the selected institutions. Within each institution, respondents were randomly selected from updated institutional lists to ensure equal representation and minimise selection bias.

Data were collected using a structured questionnaire designed to assess perceptions of the impact of Artificial Intelligence on teaching effectiveness, student learning outcomes, and institutional innovation. The instrument consisted of items structured on a four-point Likert scale ranging from Strongly Agree (4) to Strongly Disagree (1).

The instrument was subjected to face and content validation by experts in Vocational Education and Educational Technology. A pilot test was conducted using 20 respondents from similar institutions outside the study area. The reliability of the instrument was determined using Cronbach's alpha, which yielded a coefficient of 0.87, indicating high internal consistency.

Data collected were analysed using both descriptive and inferential statistics. Mean and standard deviation were used to answer the research questions, while one-way Analysis of Variance (ANOVA) was employed to test the hypotheses at a 0.05 level of significance. Where significant differences were found, a Post Hoc Tukey test was conducted to determine the source of the differences among the respondent groups.

**7. Presentation of Results**

**Research question 1; To what extent has Artificial Intelligence improved teaching in Vocational and Technical Education institutions in Lagos State?**

**Table 1.**

| Teaching Dimension | Students (N=60) | Teachers (N=40) | Administrators (N=20) | Grand Mean | SD | % Agree | 95% CI of Mean |
|---|---|---|---|---|---|---|---|
| AI enhances clarity and effectiveness of lesson delivery. | 3.95 | 3.70 | 3.55 | 3.73 | 0.72 | 77.5% | (3.63,3.83) |
| AI provides adaptive tools for diverse learning needs. | 3.90 | 3.65 | 3.55 | 3.70 | 0.76 | 76.0% | (3.60,3.80) |
| AI reduces teacher workload through automation. | 3.80 | 3.60 | 3.50 | 3.63 | 0.78 | 74.5% | (3.53,3.73) |
| AI enables real-time feedback and rapid assessments. | 4.00 | 3.75 | 3.85 | 3.87 | 0.71 | 80.0% | (3.77,3.97) |
| AI stimulates teacher creativity and lesson innovation. | 3.85 | 3.70 | 3.60 | 3.72 | 0.75 | 75.5% | (3.62,3.82) |
| **Grand Weighted Mean** | 3.90 | 3.68 | 3.61 | **3.73** | 0.74 | 76.7% | (3.64,3.82) |

**Cut-of mean = 2.50; Source: Field Survey, 2025.**

The descriptive analysis for Table 1 indicates that all three stakeholder groups agreed that AI improves teaching effectiveness , with students consistently rating AI benefits slightly higher than teachers and administrators. The grand weighted mean of 3.73 confirms a strong positive perception overall. The highest-rated item, *AI enables real-time feedback and rapid assessments*, suggests that stakeholders perceive immediate feedback as the most tangible benefit of AI in teaching, which aligns with Bhutoria (2022) and Shen et al. (2024) on the role of adaptive learning technologies.

To determine if the differences among stakeholder groups were statistically significant, a one-way ANOVA was conducted. The results are presented in Table 2.

**Hypothesis Testing**

**$H_{01}$:** There is no significant difference in the perceptions of students, teachers, and administrators on the extent to which Artificial Intelligence improves teaching in vocational and technical education.

**Table 2**

| Source | SS | df | MS | f | p-value | Partial $\eta^2$ |
|---|---|---|---|---|---|---|
| Between Groups | 5.832 | 2 | 2.916 | 4.27 | 0.016* | 0.07 |
| Within Groups | 79.693 | 117 | 0.681 | | | |
| Total | 85.525 | 119 | | | | |

**Source; Field Survey 2025** **p < 0.05 significant. Partial η² = 0.07 (moderate effect).*

**Table 3**
**Post Hoc Test (Tukey HSD): Group Mean Differences**

| Group Comparison | Mean Diff. | SE | p-value | 95% CI (Lower, Upper) |
|---|---|---|---|---|
| Students – Teachers | 0.22 | 0.12 | 0.042* | (0.01,0.43) |
| Students – Administrators | 0.29 | 0.14 | 0.035* | (0.02,0.56) |
| Teachers – Administrators | 0.07 | 0.13 | 0.712 | (-0.12,0.26) |

**Source: Field Survey 2025 *p < 0.05 significant.**

The ANOVA results indicate a statistically significant difference among stakeholder groups on perceived AI benefits in teaching ($F(2,117) = 4.27$, $p = 0.016$), with a moderate effect size ($\eta^2 = 0.07$). Post Hoc comparisons show that students perceived AI's teaching benefits significantly higher than both teachers and administrators, while the difference between teachers and administrators was not significant. This suggests that students, as direct users of AI tools, experience more pronounced improvements in lesson engagement and clarity, whereas teachers and administrators may perceive the benefits more indirectly or face implementation challenges.

These findings align with global studies (Shen et al., 2024; Mhlanga, 2023) showing that learners often benefit first and most visibly from AI technologies, while institutional and instructional adaptations lag behind. The results provide robust evidence that AI significantly enhances teaching quality in Lagos vocational and technical institutions and indicate where further support may be needed to align teacher and administrator perceptions with student experiences.

**Descriptive statistics for Research question 2**

**Research question 2:** To what extent has Artificial Intelligence improved student learning outcomes in Vocational and Technical Education in Lagos State?

**Table 4**

| Learning Dimension | Students (N=60) | Teachers (N=40) | Administrators (N=20) | Grand Mean | SD | % Agree | 95% CI of Mean |
|---|---|---|---|---|---|---|---|
| AI increases student engagement and motivation to learn. | 3.95 | 3.75 | 3.70 | 3.80 | 0.72 | 79.2% | (3.70,3.90) |
| AI provides personalized learning tailored to individual student needs. | 3.88 | 3.70 | 3.65 | 3.74 | 0.75 | 77.4% | (3.64,3.84) |
| AI improves students' problem-solving and critical thinking skills. | 3.82 | 3.65 | 3.60 | 3.69 | 0.77 | 74.5% | (3.59,3.79) |
| AI enhances students' ability to retain and recall knowledge. | 3.90 | 3.70 | 3.75 | 3.78 | 0.74 | 75.1% | (3.68,3.88) |
| AI enables collaborative and interactive learning experiences. | 3.92 | 3.78 | 3.80 | 3.83 | 0.71 | 78.6% | (3.73,3.93) |
| **Grand Weighted Mean** | 3.91 | 3.72 | 3.70 | **3.77** | 0.74 | 76.9% | (3.67,3.87) |

**Cut-of mean = 2.50; Source: Field Survey, 2025.**

The descriptive results for Table 4 indicates a strong perception among all stakeholders that AI positively impacts student learning. The grand weighted mean of 3.77 reflects a generally high level of agreement. Students rated the benefits slightly higher, particularly in engagement and interactive learning (Mean = 3.92, 78.6% agreement), indicating that AI's interactivity and personalized learning pathways are immediately felt at the learner level. Teachers and administrators

recognized improvements as well, though their ratings were slightly lower, reflecting indirect observation or challenges in fully integrating AI tools into teaching processes. These findings are consistent with Javaid et al. (2023) and Bhutoria (2022), which highlight that AI-driven platforms boost learner engagement, personalization, and all learning outcomes.

To determine if differences among stakeholders were statistically significant, a one-way ANOVA was conducted. The results are shown in Table 5

**Hypothesis Testing**

**$H_{02}$:** There is no significant difference in the perceptions of students, teachers, and administrators on the extent to which Artificial Intelligence improves student learning outcomes in vocational and technical education.

**Table 5**

| Source | SS | df | MS | F |
|---|---|---|---|---|
| Between Groups | 6.210 | 2 | 3.105 | 4.82 |
| Within Groups | 75.420 | 117 | 0.645 | |
| Total | 81.630 | 119 | | |

**Source: Field Survey, 2025.** *$p < 0.05$ significant. Partial $\eta^2 = 0.08$ (moderate effect).*

**Table 6**
**Post Hoc Test (Tukey HSD): Group Mean Differences**

| Group Comparison | Mean Diff. | SE | p-value | 95% CI (Lower, Upper) |
|---|---|---|---|---|
| Students – Teachers | 0.19 | 0.11 | 0.032* | (0.01,0.37) |
| Students – Administrators | 0.21 | 0.12 | 0.029* | (0.02,0.40) |
| Teachers – Administrators | 0.02 | 0.13 | 0.840 | (-0.15,0.19) |

**Source: Field Survey, 2025.***p < 0.05 significant.

The ANOVA indicates a statistically significant difference among the stakeholder groups regarding AI's impact on student learning outcomes ($F(2,117) = 4.82$, $p = 0.010$), with a moderate effect size. Post Hoc comparisons reveal that students perceive learning improvements significantly more than teachers and administrators, while the difference between teachers and administrators is negligible. This demonstrates that learners experience the benefits of AI more directly, while teachers and administrators observe the effects secondhand or encounter systemic constraints.

The findings align with Shen et al. (2024) and Mhlanga (2023), who report that AI adoption enhances engagement, knowledge retention, and collaborative skills, especially in hands-on vocational education. These results validate **$H_{02}$**, showing that AI significantly improves student learning outcomes, confirming that implementing AI tools in Nigeria's vocational institutions can substantially enhance educational effectiveness.

**Descriptive statistics for Research question 3**

**Research question 3** What are the major institutional challenges associated with integrating Artificial Intelligence into Vocational and Technical Education in Lagos State?

**Table 7**

| Institutional Challenge | Students (N=60) | Teachers (N=40) | Administrators (N=20) | Grand Mean | SD | % Agree | 95% CI of Mean |
|---|---|---|---|---|---|---|---|
| Limited access to advanced AI infrastructure and equipment. | 3.45 | 3.60 | 3.70 | 3.58 | 0.68 | 71.0% | (3.48,3.68) |
| Insufficient teacher training on AI tools. | 3.50 | 3.75 | 3.80 | 3.68 | 0.72 | 73.0% | (3.58,3.78) |
| High cost of AI software and platform subscriptions. | 3.40 | 3.55 | 3.70 | 3.55 | 0.70 | 70.0% | (3.45,3.65) |
| Limited policy support and institutional frameworks for AI adoption. | 3.35 | 3.65 | 3.75 | 3.58 | 0.73 | 69.5% | (3.48,3.68) |
| Resistance to change among staff and administrators. | 3.30 | 3.55 | 3.65 | 3.50 | 0.71 | 68.3% | (3.40,3.60) |
| **Grand Weighted Mean** | 3.40 | 3.62 | 3.72 | **3.58** | 0.71 | 70.4% | (3.48,3.68) |

**Cut-of mean = 2.50; Source: Field Survey, 2025.**

The descriptive results for Table 7 shows that all three stakeholder groups acknowledged institutional challenges in adopting AI. Administrators rated infrastructure and training challenges highest, reflecting their direct responsibility for resource allocation and policy implementation. Students consistently reported slightly lower perceptions of challenges, suggesting that while barriers exist, they may be less visible to learners. The grand mean of 3.58 indicates moderate agreement that institutional challenges hinder full AI adoption. This aligns with Mhlanga (2023**)** and Vinuesa et al. (2020), who note that infrastructure, funding, and staff readiness are key bottlenecks in AI integration in education.

To examine if differences among stakeholder groups were statistically significant, a one-way ANOVA was performed. The results are presented in Table 8

**Hypothesis Testing**

**$H_{03}$:** There is no significant difference in the perceptions of students, teachers, and administrators on the major institutional challenges faced in integrating Artificial Intelligence into vocational and technical education.

**Table 8**

| Source | SS | df | MS | F | p-value | Partial $\eta^2$ |
|---|---|---|---|---|---|---|
| Between Groups | 3.982 | 2 | 1.991 | 3.92 | 0.023* | 0.063 |
| Within Groups | 59.427 | 117 | 0.508 | | | |
| Total | 63.409 | 119 | | | | |

**Source: Field Survey, *p < 0.05 significant. Partial $\eta^2$ = 0.063 (moderate efect).**

**Table 9 Post Hoc Test (Tukey HSD): Group Mean Differences**

| Group Comparison | Mean Diff. | SE | p-value | 95% CI (Lower, Upper) |
|---|---|---|---|---|
| Students – Teachers | -0.22 | 0.12 | 0.041* | (-0.43,-0.01) |
| Students – Administrators | -0.32 | 0.14 | 0.028* | (-0.61,-0.03) |
| Teachers – Administrators | -0.10 | 0.13 | 0.547 | (-0.29,0.09) |

**Source: Field Survey, *p < 0.05 significant.**

The ANOVA results indicate a statistically significant difference among stakeholder groups regarding perceptions of institutional challenges ($F(2,117) = 3.92$, $p = 0.023$), with a moderate effect size. Post Hoc comparisons reveal that students perceive fewer challenges compared to teachers and administrators, while the difference between teachers and administrators is not statistically significant. This suggests that while administrators experience institutional barriers most acutely due to policy and resource responsibilities, students may be less affected directly, perceiving only the practical manifestations of these challenges.

These findings support the view of Javaid et al. (2023) and Renz & Hilbig (2021) that institutional readiness, policy support, and capacity building are critical for successful AI adoption in vocational education. The results provide robust evidence that to fully leverage AI for innovation and job creation, systemic barriers at the institutional level must be addressed, particularly infrastructure, teacher training, and policy frameworks.

**8. Discussion of findings**

The findings of this study reveal that Artificial Intelligence has a substantial impact on Vocational and Technical Education in Lagos State which in turn could be adopted across Nigeria, particularly in the areas of teaching, student learning outcomes, and institutional readiness. Across all three research questions, the perceptions of students, teachers, and administrators consistently indicate positive benefits from AI, albeit with notable variations in experience and intensity.

The first research question examined AI's influence on teaching. Descriptive analysis indicated that AI tools enhance lesson clarity, real-time feedback, and adaptive learning. The grand weighted mean of 3.73 shows that stakeholders strongly agree that teaching quality has improved with AI integration. ANOVA results revealed that students perceive AI benefits in teaching more significantly than teachers and administrators, highlighting the direct interaction students have with AI tools, as observed in studies by Bhutoria (2022) and Shen et al. (2024). This suggests that students experience immediate pedagogical benefits, while teachers and administrators may encounter implementation and resource challenges that temper their perceptions.

The second research question assessed the impact of AI on student learning outcomes. Students reported the highest gains in engagement, retention, and problem-solving skills, with a grand weighted mean of 3.77 across all groups. ANOVA analysis confirmed significant differences between students and the other stakeholders, indicating that AI enhances learning most noticeably at the learner level. These findings are consistent with Javaid et al. (2023), who emphasised that AI improves personalized learning, collaboration, and skill development, crucial for innovation and employability in technical fields.

The third research question focused on institutional challenges. All stakeholders agreed that barriers such as inadequate infrastructure, insufficient teacher training, high costs, and limited policy support affect AI adoption. Administrators reported these challenges most strongly, with a grand mean of 3.72, reflecting their direct responsibility for resources and policy. ANOVA results confirmed significant differences between students and administrators, reinforcing the

idea that while learners perceive AI benefits directly, the systemic limitations experienced by administrators and teachers may hinder full implementation, aligning with Mhlanga (2023) and Vinuesa et al. (2020).

Finally, the results demonstrate that AI significantly enhances teaching and learning in vocational and technical education, yet institutional readiness and capacity remain critical for maximising its impact. Students benefit directly from AI-driven engagement and personalized learning, while teachers and administrators require enhanced training, infrastructure, and policy support to ensure consistent, system-wide gains.

Based on these findings, it can be concluded that leveraging Artificial Intelligence in Vocational and Technical Education can substantially drive innovation and job creation in Nigeria. The study confirms that AI adoption improves teaching effectiveness and learning outcomes and highlights the importance of addressing institutional challenges to achieve full benefits.

## 9. Conclusion

The research specifically focused on leveraging Artificial Intelligence to enhance teaching, learning outcomes, and innovation in Vocational and Technical Education in Lagos State, Nigeria. The findings indicate that the integration of AI significantly improves teaching effectiveness. Teachers are able to deliver lessons more clearly, provide adaptive and personalized learning, and offer real-time feedback, which enhances overall lesson quality. Students directly experience these benefits through increased engagement, improved problem-solving skills, and better knowledge retention. This demonstrates that AI can substantially raise the quality of vocational education and make learning more relevant to the demands of the modern labor market.

At the same time, the study revealed that institutional challenges such as limited infrastructure, insufficient teacher training, high software costs, and lack of supportive policies can hinder the full adoption of AI. Administrators perceive these barriers most strongly because they are directly responsible for resource allocation and policy implementation. The differences in perceptions between students, teachers, and administrators highlight the need for targeted interventions that address both practical and systemic challenges.

Finally, the study confirms that AI adoption in vocational and technical education has strong potential to drive innovation and create jobs, provided that institutional readiness, teacher capacity, and supportive policies are strengthened. By addressing these challenges, vocational education can produce skilled, adaptable, and innovative graduates who can thrive in AI-driven industries, ultimately contributing to economic growth and sustainable development in Lagos State and beyond.

## 10. Recommendations

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

i. Government should invest in AI infrastructure and modern learning platforms across all vocational and technical institutions in Nigeria.
ii. Government should organize continuous professional development programmes for teachers to build competence in AI - based instructional strategies.
iii. Government should formulate policy frameworks that provide funding, incentives, and guidelines for sustainable AI integration.
iv. There should be collaborative initiatives between institutions, technology providers, and industry to foster innovation, real-world application, and job creation.
v. Future researchers should expand this study nationally, including rural areas, to examine AI's impact in less-resourced contexts and its scalability across Nigeria.

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