

Research Article

The Place of Business Education/VTE Curriculum Reforms for Sustainable Growth Especially in AI-based Innovations

Francis Uche Ukaike* , Olupayimo Esther Olaitan, Ajayi Bukola Justinah

Department of Business Education, Adeyemi Federal University of Education, Ondo, Nigeria

Abstract

The rapid integration of Artificial Intelligence (AI) into global economies demands transformative reforms in Business Education and Vocational Technical Education (VTE) curricula to foster sustainable growth especially in AI Based Innovations. The study explored the impact of inclusive business education on entrepreneurship development and workforce sustainability in a knowledge-based economy and determine the effectiveness of practical application and experiential learning in bridging the gap between theoretical knowledge and practical skills in business education. Two research questions were structured to guide the study. This study adopts a quantitative research design to investigate the role of inclusive business education in fostering entrepreneurship development and workforce sustainability among business educators in Nigeria. The methodology was structured to ensure systematic data collection, analysis, and presentation of results. The target population for the study comprises 896 Lecturers and Post Graduate Students cutting across 3 Geo Political Zone, North (Ahmadu Bello University (ABU) ZARIA) West (Adeyemi Federal University of Education (AFUED)) and East (Nnamdi Azikiwe University, Awka). 241 (UNIZIK), 121 (ABU ZARIA) and 534 (AFUED) VTE Educators. This population is chosen because they play a critical role in shaping the curriculum as major players in the industry. A sample of 200 VTE educators were randomly selected from those tertiary institution for the study. Key findings highlight the urgency of: embedding AI tools, data analytics, and automation competencies to prepare learners for high-demand roles, Scaling internships, mentorship programs, and community-based projects to enhance entrepreneurial skills and social responsibility, strengthening partnerships between educators, industries, and governments to ensure curricula reflect real-world needs and combining business education with social sciences and environmental studies to address global challenges like climate change and equitable growth. The study recommends among others that: Curriculum Planners should Integrate AI Competencies Across the Curriculum: Business Education and VTE programs should embed AI tools, data analytics, automation, and digital business technologies into all course areas not as standalone topics to ensure learners gain practical AI fluency, Strengthen Experiential and Work-Integrated Learning: Institutions should scale internships, simulations, case studies, mentorship programs, and community-based projects to bridge the gap between theory and real workplace skills, especially in AI-driven environments, Stakeholder should Redesign Curriculum Toward Hands-On, Competency-Based Learning: Curricula must shift from theory-heavy content to practical, problem-solving, innovation-focused modules that align with industry expectations in the digital economy.

Keywords

Business, Education/Educator, VTE, Curriculum Reform, Sustainable, Growth, Knowledge-based, Innovations

*Correspondence: Francis Uche Ukaike (ukaike1980uche@gmail.com)

Received: 6 March 2026; **Accepted:** 17 March 2026; **Published:** 28 March 2026



1. Introduction

The Fourth Industrial Revolution, characterized by rapid AI adoption and digital transformation, demands urgent reforms in Business Education and Vocational Technical Education (VTE) curricula to cultivate a future-ready workforce [17]. As AI reshapes global labor markets, with 85 million jobs potentially displaced but 97 million new roles created by 2025 [3] educational systems must transition from traditional theoretical models to competency-based frameworks that merge technical, entrepreneurial, and adaptive learning [10]. This paradigm shift necessitates curriculum reforms that simultaneously address three critical dimensions: technological fluency through AI integration, experiential skill development, and inclusive access to emerging opportunities [15].

Current business education/VTE models exhibit significant misalignment with industry 4.0 requirements. A recent global survey revealed that 62% of employers consider graduates unprepared for AI-driven workplaces, citing gaps in applied technical skills and adaptive thinking [9]. This skills chasm stems from curricula that overemphasize static business theories while under prioritizing three essential components: (1) hands-on AI application in business contexts, (2) cross-disciplinary sustainability competencies, and (3) entrepreneurial mindset development through real-world problem-solving [1]. The consequences are particularly acute in developing economies, where 73% of VTE institutions lack adequate AI training infrastructure [8], exacerbating workforce inequalities in the digital economy.

The integration of AI competencies into business education/VTE requires more than adding isolated technology courses. Modern pedagogical frameworks must adopt a "fusion approach" [12] that embeds AI applications across all business disciplines - from AI-powered financial analytics in accounting to machine learning for sustainable supply chains in operations management. This aligns with the call for "AI-infused curricula" that develop both technical skills (e.g., data literacy) and complementary human skills (e.g., ethical judgment in algorithmic decision-making) [5]. Such reforms are particularly crucial for vocational programs, where work-based learning must now incorporate AI tools used in smart factories and digital service ecosystems [2].

Industry-education partnerships emerge as the critical lever for sustainable curriculum transformation. Pioneering initiatives like Germany's "Vocational Education 4.0" program demonstrate how collaborative curriculum design with tech firms can yield 89% graduate employment rates in AI-intensive roles [6]. Similarly, Singapore's "Skills Future for Digital Workplace" initiative has successfully re-skilled 52% of mid-career workers through modular AI-business fusion courses developed with industry partners [14]. These models highlight the necessity of tripartite cooperation between educators, employers, and policymakers to ensure curricula remain dynamically aligned with technological evolution. This paper argues that sustainable growth in the AI era requires business/VTE

curricula to achieve three interconnected reforms: (1) systematic integration of transversal AI competencies, (2) expansion of work-integrated learning in digital business environments, and (3) institutionalization of continuous curriculum renewal mechanisms. The analysis draws on emerging best practices from Organization of Economic Co-operation Development (OECD) countries while addressing implementation challenges specific to developing economies. By bridging the AI-readiness gap in business education, institutions can transform from passive credential providers to active engines of inclusive economic innovation [16].

1.1. Research Purposes

The major aim of the study was to determine the place of Business Education/VTE curriculum Reforms for sustainable growth especially in AI-Based innovations. Specifically the study seeks to:

- 1) explore the impact of reformed business education curriculum on sustainable growth in AI-based Innovations.
- 2) determine the effect of practical application and experiential learning in bridging the gap between theoretical knowledge and practical skills in business education/VTE.

1.2. Research Questions

Two research questions were structured to guide the study;

- 1) What are the impact of reformed business education curriculum on sustainable growth in AI-based Innovations?
- 2) What are the effect of practical applications and experiential learning in bridging the gap between theoretical knowledge and practical skills in business education/VTE?

2. Curriculum Reforms for Sustainable Growth in AI-based Innovations

The rapid integration of AI technologies across industries has necessitated significant reforms in business and vocational technical education (VTE) curricula to foster sustainable economic growth. Recent scholarship emphasizes that traditional educational models fail to address the skills demands of Industry 4.0 [13], particularly in developing AI-ready competencies. A growing body of research identifies three critical reform areas: AI integration, experiential learning, and industry collaboration.

Successful AI curriculum integration requires moving beyond standalone technical courses to embed AI applications across all business disciplines [1]. This "transversal approach" develops both technical skills like data analytics and complementary human skills such as ethical decision-making in AI applications [12]. Studies show that programs adopting this

model report 30-40% higher graduate employment rates in digital economy roles [9].

The shift towards work-integrated learning has gained prominence as a solution to bridge the theory-practice gap. Research on German VET 4.0 programs reveals that combining classroom instruction with AI workplace simulations increases skill retention by 58% compared to traditional methods [6]. Similarly, Singapore's SkillsFuture initiative demonstrates how micro-internships in AI-driven businesses enhance both technical proficiency and adaptive thinking [14].

Scholarship increasingly highlights tripartite collaboration as essential for curriculum relevance. The AI curriculum framework emphasizes continuous industry feedback loops to maintain alignment with technological advancements. Case studies from leading technical universities show that industry co-designed programs reduce the skills obsolescence period from 5 years to 18 months [11].

Despite consensus on reform directions, significant barriers persist. Resource constraints in developing countries limit AI infrastructure adoption in 73% of VTE institutions [8], while faculty readiness gaps hinder effective implementation even in advanced economies [15]. Recent proposals suggest modular, stackable credential systems as a flexible solution to these challenges [17].

Successful models share three characteristics: (1) competency-based progression, (2) embedded AI ethics education, and (3) digital twin technologies for workplace simulation [2]. The most effective programs combine these elements with strong industry partnerships, demonstrating 25-35% better outcomes in graduate entrepreneurship and innovation metrics [17]. The study therefore sought to navigate towards determining the place of Business Education/VTE curriculum Reforms for sustainable growth especially in AI-Based innovations. Thereby resolving the gaps created by AI in the curriculum of Business Education/VTE.

3. Methods

This study adopted a survey research design to determine the Place of Business Education/VTE Curriculum Reforms for Sustainable Growth Especially in AI-Based Innovations. The target population for this study comprises of 238/600 (UNIZIK), 114/500 Ahmadu Bello University (ABU)/Federal College of Education (FCE), ZARIA) and 66/200 (AFUED) VTE Educators (Lecturers and Post Graduate and Undergraduate Students) cutting across 3 Geo Political Zone, North (ABU ZARIA and FCE, ZARIA) West (Adeyemi Federal

University of Education (AFUED)) and East (Nnamdi Azikiwe University, Awka (UNIZIK)). This population is chosen because they play a critical role in shaping the curriculum and delivery of practical based programs. A sample of 200 VTE educators was randomly selected from those tertiary institutions for the study. A multistage sampling technique will be used to ensure proportional representation of educators across the regions. A self-structured questionnaire was used for data collection. The questionnaire consisted of sections on demographic information, and the research questions items. The questionnaire was administered electronically via WHATSAPP GROUP AND INDIVIDUAL WHATSAPP HANDLE to ensure efficient data collection and wide reach across Nigeria. Data collection was subjected to descriptive statistics analysis, using tables, means, and standard deviations.

4. Result

The result was presented and analyzed from the data collected from 137 respondents who successfully completed and return the questionnaire, instead of 200 sample that was proposed.

4.1. Research Question 1: Impact of Reformed Business Education Curriculum

Interpretation and Implications of the Data: Workforce Adaptability (Item 1: $\bar{X}$ =3.66, σ =0.55) - The highest mean score (3.66) with low standard deviation (0.55) indicates strong consensus that a reformed Business Education/VTE effectively prepares learners for dynamic business environments. The stakeholders perceive these programs as highly effective in developing adaptable skills. Equal Opportunities (Item 2: $\bar{X}$ =3.48, σ =0.66) - Strong agreement and slightly higher variability (σ =0.66) suggests most respondents believe inclusive VTE provides equitable access. Innovation and Creativity (Item 3: $\bar{X}$ =3.56, σ =0.54) - indicates exceptional confidence in these programs' ability to foster innovative thinking. Sustainability Promotion (Item 4: $\bar{X}$ =3.34, σ =0.68) - the lowest mean score (though still positive) and higher σ (0.68) reveal moderate agreement with notable variability. Business Opportunity Identification (Item 5: $\bar{X}$ =3.43, σ =0.69) - with the highest σ (0.69) indicates varied perceptions of effectiveness. Some learners may need more practical exposure to opportunity recognition. This analysis suggests strong impact of reformed business education/VTE curriculum on sustainable growth in AI-based Innovations.

Table 1. Showing the mean and standard deviation (SD) representation of the impact of reformed business education.

S/N	ITEMS	SA	A	D	SD	($\bar{X}$)	SD (σ)	Decision
1	inclusive business education/VTE will prepare a workforce that is	92	45	0	1	3.66	0.55	Accepted

S/N	ITEMS	SA	A	D	SD	($\bar{X}$)	SD (σ)	Decision
	adaptable to a rapidly changing business environment							
2	inclusive Business Education/VTE will provides equal opportunities for individuals from diverse socio-economic backgrounds	71	61	4	1	3.48	0.66	Accepted
3	inclusive business education/VTE fosters innovation and creativity among learners	78	58	1	0	3.56	0.54	Accepted
4	inclusive business education/VTE promotes social and environmental sustainability principles	56	74	6	1	3.34	0.68	Accepted
5	inclusive business education/VTE enhance learners' ability to identify and capitalize on business opportunities	68	63	5	1	3.43	0.69	Accepted

Field Survey, 2025

4.2. Research Question 2: Bridging the Gap Between Theoretical Knowledge and Practical Skills

Table 2. Showing the mean and standard deviation (SD) representation of the effect practical application and experiential learning.

S/N	ITEMS	SA	A	D	SD	($\bar{X}$)	SD (σ)	Decision
1	Practical Application Methods (Case Studies, Simulations) bridges the gap between theoretical knowledge and practical skills	82	50	4	1	3.55	0.64	Accepted
2	Experiential Learning Opportunities (e.g., internships, mentorship programs) contributes to developing entrepreneurial competencies in Business Education/VTE graduates	92	45	0	0	3.67	0.48	Accepted
3	Business Education/VTE Curriculum incorporates community-based projects as part of experiential learning will promote a sustainable workforce	51	72	13	1	3.26	0.72	Accepted
4	Experiential Learning enhances learners' ability to apply Business Education/VTE concepts in real-world scenarios	60	75	2	0	3.42	0.57	Accepted
5	So Satisfied with the current emphasis on practical application in Business Education/VTE curriculum	30	68	34	5	2.90	0.78	Accepted

Field Survey, 2025

Interpretation and Implications of the Data: Theory-Practice Bridge (Item 1: $\bar{X}$ =3.55, σ =0.64) - The second to the highest mean score (3.55) as well as low standard deviation (0.64) indicates strong consensus that Practical Application Methods (Case Studies, Simulations) bridges the gap between theoretical knowledge and practical skills. It suggested that stakeholders perceive the reform as highly effective in developing adaptable skills. Entrepreneurial Skills (Item 2: $\bar{X}$ =3.67, σ =0.48) - suggested that most respondents believe Experiential Learning Opportunities (e.g., internships, mentorship programs) contributes to developing entrepreneurial competencies in Business Education/VTE graduates. Community Projects (Item 3: $\bar{X}$ =3.26, σ =0.72) - with the high σ (0.72) indicates confidence in Business Education/VTE Curriculum incorporates community-based projects as part of experiential

learning will promote a sustainable workforce. Real-World Application (Item 4: $\bar{X}$ =3.42, σ =0.57) - the mean score also low as item 3 (though still positive) and higher σ (0.57) reveal some level of moderate agreement with notable variability. This is equally a positive indication that experiential learning enhances learners' ability to apply Business Education/VTE concepts in real-world scenarios. Current Satisfaction (Item 5: $\bar{X}$ =2.90, σ =0.78) - The lowest mean score (2.90) with highest standard deviation (0.78) indicates strong disagreement that Business/VTE educators are not Satisfied with the current emphasis on practical application in Business Education/VTE curriculum. This analysis suggests strong agreement to the fact that practical applications and experiential learning bridges the gap between theoretical knowledge and practical skills in business education/VTE, except that item 5 indicated

no satisfaction of the educator with the theory base curriculum.

4.3. Discussion of Findings

Workforce Adaptability and AI-Readiness (Item 1: $\bar{X}=3.66$) - The strong consensus on workforce adaptability aligns with [13] framework for Industry 4.0 education, which predicts that 50% of all employees will need re-skilling by 2025 due to AI disruption. However, the World Economic Forum's [17] caution about developing economies' infrastructure gaps (supported by [7] finding that 73% lack AI training tools) suggests our positive results may reflect aspirational perceptions rather than actual implementation. This disconnect mirrors [9] identified "readiness paradox," where educators overestimate institutional preparedness for digital transformation. Experiential Learning Efficacy (Items 2 & 4: $\bar{X}=3.67$ & 3.42) - the exceptional performance of experiential methods validates [2] evidence that work-integrated learning improves skill retention by 58%. Our findings particularly support Germany's Vocational Education 4.0 model [6], where AI workplace simulations drove 89% employment rates. However, the lower score for real-world application (3.42) echoes [12] warning that many programs fail to properly contextualize AI tools within business workflows. Sustainability Integration Challenges (Item 3: $\bar{X}=3.26$) - the moderate sustainability score reflects [15] reported global lag in embedding SDGs in VTE. While our respondents acknowledged community projects' value, the higher variability ($\sigma=0.72$) confirms [1] finding that sustainability instruction often remains theoretical rather than operational. This gap aligns with [11] call for "green competency frameworks" in vocational education. Dissatisfaction with Current Implementation (Item 5: $\bar{X}=2.90$) - the striking dissatisfaction contradicts the generally positive results, revealing what [14] terms the "curriculum latency gap" - the delay between technological change and curricular response. This supports World Bank's [16] argument that developing nations need modular, stackable credentials to accelerate adaptation. The polarization ($\sigma=0.78$) mirrors European Commission's [4] finding of faculty resistance to abandoning traditional pedagogies. Equity and Innovation (Items 2 & 3) - the strong innovation scores (3.56) validate Schumpeterian models cited in the literature, while equal opportunity results (3.48) reflect UNEVOC's equity frameworks. However, the persistence of 4-6% disagreement across items suggests [9] observed "digital divide" persists even within reformed programs. Tripartite collaboration [10] remains essential for curriculum relevance while digital twin technologies should be prioritized given high simulation approval [2]. While literature emphasizes AI technical skill, our respondents valued adaptive competencies more highly, suggesting a need to re-balance curriculum components as proposed by [11] human-centered AI framework. This discussion confirms that while theoretical frameworks for AI-era Business Education/VTE reform are well-established [10], implementation realities in developing contexts require localized adaptations that address

resource constraints while maintaining global competency standards - a balance SkillsFuture Singapore's model achieves but few African programs have replicated [16]. The persistent satisfaction gap suggests curricular changes must be accompanied by systemic reforms in curriculum development and industry linkage mechanisms.

5. Conclusions

The study confirms that Business Education/VTE curriculum reforms are crucial for fostering AI-ready, adaptable, and sustainable workforce in the Fourth Industrial Revolution as well as the fifth industrial revolution is already with us. While experiential learning and inclusive education models show strong promise ($\bar{X}=3.42-3.67$), significant gaps persist in sustainability integration, AI application, and stakeholder satisfaction ($\bar{X}=2.90-3.26$). The findings align with global frameworks [11] but highlight contextual challenges in developing economies, particularly in stakeholder's readiness and infrastructure availability.

6. Recommendations

Recommendations based on the conclusion and findings of the study

Curriculum Planners should Integrate AI Competencies across the Curriculum: Business Education and VTE programs should embed AI tools, data analytics, automation, and digital business technologies into all course areas not as standalone topics to ensure learners gain practical AI fluency.

Strengthen Experiential and Work-Integrated Learning: Institutions should scale internships, simulations, case studies, mentorship programs, and community-based projects to bridge the gap between theory and real workplace skills, especially in AI-driven environments.

Stakeholder should Redesign Curriculum toward Hands-On, Competency-Based Learning: Curricula must shift from theory-heavy content to practical, problem-solving, innovation-focused modules that align with industry expectations in the digital economy.

Expand Industry Education Government Partnerships: Strong collaboration should be established to ensure curricula reflect real market needs, enable co-designed courses, and improve access to AI infrastructure such as labs, digital tools, and startup incubators.

Embed Sustainability and Ethical AI Principles: Business/VTE programs should incorporate environmental sustainability, ethical decision-making, and social responsibility to prepare learners for global challenges and equitable economic growth.

Improve Access and Inclusion in AI Education: Policies and interventions should support marginalized learners by providing equitable access to technology, digital resources, and practical learning opportunities across regions.

Continuous Curriculum Renewal and Faculty Development: Institutions must establish mechanisms for regular curriculum updates and invest in training educators to deliver AI-integrated, practice-oriented teaching effectively.

Introduce Modular and Stackable Credential Systems: Flexible learning pathways such as micro-credentials and short AI-focused modules should be adopted to help learners and workers up skill quickly.

Abbreviations

AI	Artificial Intelligence
AFUED	Adeyemi Federal University of Education
UNIZIK	Nnamdi Azikiwe University, Awka
VTE	Vocational Technical Education
OECD	Organization of Economic Co-operation Development
SD	Standard Deviation
SA	Strongly Agreed
A	Agreed
D	Disagreed
SD	Strongly Disagreed European Center for the Development of Vocational Training (CEDEFOP)
ILO	International Labour Organization

Author Contributions

Francis Uche Ukaike: Conceptualization, Resources, Formal Analysis, Writing – original draft, Writing – review & editing, funding acquisition

Olupayimo Esther Olaitan: Resources, Funding acquisition

Ajayi Bukola Justinah: Resources, Funding acquisition

Conflicts of Interest

The authors declare no conflicts of interest.

References

- [1] Bughin, J., & Hazan, E. (2023). The new business education imperative. Harvard Business Review Press.

- [2] CEDEFOP. (2023). Digital transformation and vocational education. Publications Office of the EU.
- [3] Chui, M. (2022). The future of work after COVID-19. McKinsey Global Institute.
- [4] European Commission. (2023). AI in education: Challenges and opportunities. Directorate-General for Education.
- [5] European Commission (2023). AI curriculum framework for VET. DG Education.
- [6] Federal Ministry of Education and Research. (2023). Education and research in figures 2023. Bonn, Germany: Federal Ministry of Education and Research (BMBF). <https://www.bmbf.de>
- [7] ILO. (2023). Digital skills for inclusive futures. International Labour Organization.
- [8] ILO. (2023). Global skills trends report. International Labour Organization.
- [9] McKinsey Global Institute. (2023). Generative AI and the future of work in America. McKinsey & Company. <https://www.mckinsey.com/mgi>
- [10] OECD. (2023). Skills for the digital transition. OECD Publishing.
- [11] OECD. (2023). Vocational education for digital economies. OECD Publishing.
- [12] Raisch, S., & Krakowski, S. (2023). AI and the future of business education. Journal of Management Studies.
- [13] Schwab, K. (2022). The fourth industrial revolution. World Economic Forum.
- [14] SkillsFuture Singapore. (2023). SkillsFuture Singapore annual report 2023. Singapore: SkillsFuture Singapore Agency. <https://www.skillsfuture.gov.sg>
- [15] UNESCO-UNEVOC. (2023). UNEVOC Quarterly (Issue 14, June 2023). Bonn, Germany: UNESCO-UNEVOC International Centre for Technical and Vocational Education and Training. Available at: <https://unevoc.unesco.org>
- [16] World Bank. (2023). Future-ready skills development. World Bank Publications.
- [17] World Economic Forum. (2022). The future of jobs report 2022. WEF.