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Editor's Note

This volume presents a focused and contemporary contribution to business and entrepreneurship education, with strong empirical evidence drawn largely from universities, and related contexts across Nigeria, and beyond. The articles explore emerging themes such as artificial intelligence integration, e-learning, entrepreneurship training, curriculum relevance, pedagogical innovation, and enterprise development within higher education systems. The collection reflects the growing intersection between technology, pedagogy, and entrepreneurial outcomes, while also addressing practical concerns such as poverty reduction, market sustainability, and small business performance. The institutional coverage highlights the University of Calabar, University of Cross River State, and other affiliated academic and professional environments, reinforcing the regional relevance and broader applicability of the findings.

The journal invites scholars, researchers, and practitioners to contribute high-quality manuscripts that advance knowledge in business education, entrepreneurship, digital transformation, and related disciplines. Submissions that offer empirical rigor, theoretical advancement, and practical relevance to developing and global education systems are particularly encouraged.

ARTIFICIAL INTELLIGENCE TOOLS AS PREDICTORS OF TEACHING AND LEARNING OF ENTREPRENEURSHIP EDUCATION IN PUBLIC UNIVERSITIES IN CROSS RIVER STATE, NIGERIA

DR. EDET E. OKON
okon_e@ymail.com**;** edet.okon@unical.edu.ng**;** edisonblackson@gmail.com ORCID ID: https://orcid.org/0000-0002-5974-0818

&
HELEN AMUNG IKPALI helenikpali36@gmail.com

Department of Business Education
Faculty of Vocational and Entrepreneurial Education
College of Education
University of Calabar, Calabar – Nigeria

Abstract

This study investigated the influence of artificial intelligence on the teaching and learning of entrepreneurship education in public universities in Cross River State, Nigeria. A predictive correlational research design was adopted. A sample of 110 second-year undergraduate students of Business Education was selected using the simple random sampling technique. Data were collected using an instrument titled Artificial Intelligence and the Teaching and Learning of Entrepreneurship Education (AITLEE). The reliability of the instrument was established using Cronbach's alpha, which yielded a coefficient of 0.88. The hypotheses were tested using multiple regression analysis at the 0.05 level of significance. The findings revealed that the integration of artificial intelligence, particularly through chatbots and virtual assistants, as well as simulation and virtual reality, significantly influences the teaching and learning of entrepreneurship education in public universities. Based on these findings, it was concluded that the effective teaching and learning of entrepreneurship education in public universities require the integration of artificial intelligence technologies. It was recommended that public universities should provide comprehensive training programmes for educators to facilitate the effective integration of chatbots, virtual assistants, and simulation and virtual reality into instructional practices, with emphasis on both technical competence and pedagogical application.

Keywords: Artificial intelligence, chatbots and virtual assistants, simulation and virtual reality, teaching and learning, entrepreneurship education

Introduction

Entrepreneurship education is increasingly recognized as a critical driver of economic development in Nigeria, particularly within public universities, where it seeks to equip students with the requisite skills and knowledge to thrive in a dynamic business environment. In the context of rising unemployment and a rapidly growing youth population, fostering an entrepreneurial mindset has become imperative (Akinola & Akinyemi, 2022). Entrepreneurship education refers to the process of equipping individuals with the knowledge, skills, and mindset required identifying opportunities, creating value, and establishing business ventures (Alagappar, Xavier, & Jambulingam, 2023). It also encompasses the development of critical thinking, problem-solving, and innovation

competencies applicable across diverse contexts (Nabi & Holden, 2020). Consequently, entrepreneurship education contributes to economic development by preparing graduates for self-employment and

job creation (Adebayo & Afolabi, 2021). The teaching and learning of entrepreneurship education are interrelated processes that facilitate the development of entrepreneurial competencies and mindsets. Nwankwo and Ugochukwu (2020) conceptualized teaching and learning in this context as an integrated approach combining instructional strategies and active student engagement.

Teaching entrepreneurship emphasizes experiential learning through real-world projects, simulations, and case studies (Gibb, 2020), while learning entrepreneurship involves active participation, reflection, and the development of entrepreneurial identity (Taatila, 2020). These processes create a holistic learning experience that enhances innovation and adaptability. Despite its importance, entrepreneurship education in many Nigerian universities remains largely theoretical and insufficiently aligned with contemporary technological and market realities (Ojeifo & Ojeifo, 2020). This limitation has contributed to inadequate student preparedness for realworld entrepreneurial challenges. In response, the integration of artificial intelligence (AI) has emerged as a viable strategy for enhancing teaching and learning outcomes. Artificial intelligence refers to the capability of machines to perform tasks that typically require human intelligence (Craig, Laskowski, & Tucci, 2024), including learning, decision-making, and problemsolving (Glover, 2024).

The application of AI in entrepreneurship education offers opportunities for personalized, interactive, and data-driven learning experiences (Kumar & Singh, 2021). AI-driven analytics can enhance instructional practices and improve student engagement (González & López, 2021), while also supporting curriculum innovation (Choudaha & Chang, 2020). Technologies such as chatbots, virtual assistants, simulations, and virtual reality have introduced new pedagogical possibilities that facilitate experiential and immersive learning. Okon, Ewuru, and Undie (2024) examined the influence of artificial intelligence-enhanced cognitive processes on the learning abilities of Business Education undergraduates in universities in Cross River State, Nigeria. Using a descriptive survey design with a sample of 358 students, and analysing data through simple linear regression, the study found that AI-enhanced cognitive processes have a positive and statistically significant influence on students‘ learning abilities. This finding suggests that

AI-driven tools enhance cognitive engagement, comprehension, and academic performance among undergraduates. The study further concluded that the integration of cognitive AI into educational practices has the potential to reshape the learning environment by improving students‘ intellectual capabilities, provided its usage is properly guided to prevent misuse. This empirical evidence underscores the transformative potential of artificial intelligence in enhancing teaching and learning outcomes in higher education contexts. The study provides strong empirical evidence on the general impact of AI on learning outcomes, which serves as a foundational justification for examining specific AI tools (chatbots, virtual assistants, simulation, and VR) in the present study. It strengthens the conceptual linkage between AI and learning effectiveness, thereby improving the logical flow from general AI applications to specific technological components examined in the research.

Chatbots are AI-driven systems designed to simulate human conversation and provide instant responses to user queries (Raj, 2025). In educational contexts, they support learning by offering feedback, answering questions, and providing resources (Nwokedi & Okeke, 2023). Virtual assistants extend these capabilities by managing tasks, delivering personalized recommendations, and enhancing productivity (McCarthy, 2023; Adeola, 2022). Empirical studies have demonstrated that these tools enhance student engagement and facilitate personalized learning experiences (Mavridis & Tzafestas, 2020; Zhou & Xu, 2021; Kumar & Gupta, 2019). However, challenges such as technical limitations and user resistance persist (Fadhil & Alshahrani, 2018). Evidence also indicates that chatbots can improve learning outcomes and knowledge retention in entrepreneurship education (Ranjan & Kumar, 2022; Ojo & Adeyemo, 2022).

Simulation and virtual reality represent another dimension of AI application in education. Business simulations provide experiential learning environments that replicate real-world scenarios, enabling students to develop decision-making and problem-solving skills (Celemi, n.d.; Garcia, Herrity, Gafner, & Eads, 2025). Virtual reality offers immersive experiences that enhance engagement and understanding of complex concepts (Olaniyan & Ojo, 2022). Empirical studies have shown that these technologies improve learning outcomes, engagement, and entrepreneurial competencies (Dede & Richards, 2021; Lee & Kim, 2022; Wang & Chen, 2023; Smith & Brown, 2020; Nwokedi & Okeke, 2021; Ojo & Adeyemo, 2022). Notwithstanding these benefits, the integration of AI in entrepreneurship education presents several challenges. These include overreliance on technology, which may diminish critical thinking skills (Kaplan & Haenlein, 2020), reduced human judgment in decision-making (Shrestha, 2019), algorithmic bias (Hao, 2019), and data privacy concerns (Zhang & Dafoe, 2019). Additionally, inadequate infrastructure and limited educator competence hinder effective implementation. Addressing these challenges is essential for maximizing the potential of AI in entrepreneurship education. This study therefore investigates the influence of specific AI technologies, namely chatbots, virtual assistants, simulation, and virtual reality, on the teaching and learning of entrepreneurship education in public universities in Cross River State, Nigeria.

Research methods

A predictive correlation research design was adopted for the study. This design was considered appropriate because it enables the examination of relationships between variables and the extent to which independent variables predict outcomes without manipulation. The study was conducted in public universities in Cross River State, Nigeria, namely the University of Calabar and the University of Cross River State. These institutions offer entrepreneurship education as a compulsory component of undergraduate programmes. The population comprised 152 second-year Business Education undergraduates from the two universities. A sample of 110 students was selected using the simple random sampling technique through the hat-and-draw method, ensuring equal probability of selection and minimizing sampling bias. Data were collected using a structured questionnaire titled Artificial Intelligence and the Teaching and Learning of Entrepreneurship Education (AITLEE), developed by the researcher. The instrument consisted of two sections. Section A captured demographic information, while Section B contained 24 items measuring the influence of chatbots and virtual assistants, as well as simulation and virtual reality. Responses were structured on a four-point scales ranging from strongly agree to strongly disagree. The instrument was subjected to face and content validation by three experts, two in Business Education and one in Measurement and Evaluation. A pilot study involving 30 respondents was conducted to establish reliability. Cronbach's alpha yielded a coefficient of 0.88, indicating high

internal consistency. The questionnaire was administered with the assistance of two trained research assistants. Completed copies were retrieved immediately to ensure a high response rate. Data were analyzed using multiple regression analysis to test the null

Results

The results of the analysis presented in Tables 1 and 2 address the research questions, while Tables 3 and 4 present the outcomes of the hypotheses tested at the 0.05 level of significance.

hypotheses at the .05 level of significance.

Research question 1

The first research question examined the extent to which the use of chatbots and virtual assistants influences the teaching and learning of entrepreneurship education in public universities in Cross River State, Nigeria. The

analysis was based on responses obtained of chatbots and virtual assistants. The result is from questionnaire items measuring the use presented in Table 1.

Table 1: Beta (B) and Adjusted R^2 for the Influence of Chatbots and Virtual Assistants on the

Teaching and Learning of Entrepreneurship Education

Variable	B	SE	R^2	Adjusted R^2
Use of Chatbots	.269	—	.589	.582
Use of Virtual Assistants	.529	1.78930	—	—

Note. R^2 = .589; Adjusted R^2 = .582. SE = Standard Error.

The result in Table 1 indicates that chatbots and virtual assistants jointly accounted for 58.9% of the variance in the teaching and learning of entrepreneurship education (R^2 = .589; Adjusted R^2 = .582). This suggests a moderate explanatory power of the model. The standardized beta coefficients show that virtual assistants (β = .529) exert a stronger influence on teaching and learning than chatbots (β = .269). This implies that
although both tools are relevant, virtual assistants contribute more substantially to enhancing entrepreneurship education.

Research question 2
The second research question examined the extent to which the use of simulation and virtual reality influences the teaching and learning of entrepreneurship education in public universities in Cross River State, Nigeria. The result is presented in Table 2.

Table 2: Beta (B) and Adjusted R^2 for the Influence of Simulation and Virtual Reality on the

Teaching and Learning of Entrepreneurship Education

Variable	B	SE	R^2	Adjusted R^2
Use of Chatbots	0.269	—	0.589	0.582
Use of Virtual Assistants	0.529	1.789	—	—

Note. SE = standard error. R^2 = coefficient of determination. Adjusted R^2 = adjusted coefficient of determination. Dashes (—) indicate values not reported.

The results in Table 2 show that simulation and virtual reality jointly explained 78.4% of the variance in the teaching and learning of entrepreneurship education (R^2 = .784; Adjusted R^2 = .780), indicating a high explanatory power. Virtual reality (β = .744) demonstrated a stronger influence compared to simulation (β = .225). This finding suggests that immersive technologies, particularly virtual reality, play a dominant role in enhancing instructional effectiveness and learning outcomes.

Null hypothesis 1

Chatbots and virtual assistants do not significantly influence the teaching and learning of entrepreneurship education in public universities in Cross River State, Nigeria.

This hypothesis was tested using multiple linear regression analysis. The F-ratio was used to determine the overall model significance, while t-tests assessed the contribution of individual predictors.

Table 3: Multiple Regression Analysis of the Influence of Chatbots and Virtual Assistants on the Teaching and Learning of Entrepreneurship Education

Model Summary	Value
R	0.768
R^2	0.589
Adjusted R^2	0.582
Std. Error of Estimate	1.78930

ANOVA	F	df	
Regression	76.788	2, 107	< .05

Coefficients	B	SE	β	t	p
Constant	47.895	1.430	—	33.496	.000
Chatbots	-0.374	0.174	-0.263	-2.155	.033
Virtual Assistants	-0.659	0.152	-0.529	-4.339	.000

Note. SE = standard error; β = standardized coefficient.

The results indicate a significant overall model, $F(2, 107) = 76.788$, $p < .05$, with an R value of .768, suggesting a strong relationship between the predictors and the dependent variable. The model explained 58.9% of the variance in teaching and learning outcomes. Both chatbots ($t = -2.155$, $p < .05$) and virtual assistants ($t = -4.339$, $p < .05$) significantly contributed to the model, although their coefficients were negative. Despite the negative coefficients, the statistical significance indicates that these variables are meaningful predictors. The null hypothesis was therefore rejected. It was concluded that chatbots and virtual assistants significantly influence the teaching and learning of entrepreneurship education. Virtual assistants demonstrated a stronger predictive influence.

Null hypothesis 2

The second null hypothesis stated that simulation and virtual reality do not significantly influence the teaching and learning of entrepreneurship education in public universities in Cross River State, Nigeria. This hypothesis was also tested using multiple linear regressions

.Table 4: Multiple Regression Analysis of the Influence of Simulation and Virtual Reality on the Teaching and Learning of Entrepreneurship Education

Model Summary	Value
R	0.886
R^2	0.784
Adjusted R^2	0.780
Std. Error of Estimate	1.29736

ANOVA	F	df	p
Regression	194.330	2, 107	< .05

Coefficients	B	SE	β	t	p
Constant	54.487	1.362	—	39.996	.000
Simulation	-0.390	0.093	-0.225	-4.213	.000
Virtual Reality	-0.975	0.070	-0.744	-13.961	.000

Note. SE = standard error; β = standardized coefficient.

The regression model was statistically significant, $F(2, 107) = 194.330$, $p < .05$, with a strong correlation coefficient ($R = .886$). The model explained 78.4% of the variance in teaching and learning outcomes.

Both simulation ($t = -4.213$, $p < .05$) and virtual reality ($t = -13.961$, $p < .05$) significantly predicted the dependent variable. Virtual reality emerged as the strongest predictor. Consequently, the null hypothesis was rejected, indicating that simulation and virtual reality significantly influence the teaching and learning of entrepreneurship education.

Discussion of findings

The findings revealed that chatbots and virtual assistants significantly influence the teaching and learning of entrepreneurship education. Their ability to personalize learning, provide immediate feedback, and support flexible access to information enhances students' engagement and learning experiences. This aligns with Kumar and Singh (2022), who emphasized that AI-driven tools facilitate interactive learning environments. Similarly, Mavridis and Tzafestas (2020) and Zhou and Xu (2021) reported that such technologies improve engagement and enable adaptive learning. The findings are also consistent with Kumar and Gupta (2019) and Fadhil and Alshahrani (2018), who highlighted both the benefits and implementation challenges of chatbot technologies in higher education.

The results further demonstrated that simulation and virtual reality significantly influence the teaching and learning of entrepreneurship education. These technologies provide immersive, experiential learning environments that enhance students' understanding and application of entrepreneurial concepts. The findings corroborate those of Dede and Richards (2021) and Nwokedi and Okeke (2021), who reported improved problem-solving skills and practical competence through simulationbased learning. In addition, Lee and Kim (2022) and Wang and Chen (2023) found that virtual reality enhances engagement, motivation, and critical entrepreneurial skills. The findings are also in agreement with Smith and Brown (2020), who observed superior performance among students exposed to VR-enhanced instruction.

Conclusions

The study established that artificial intelligence technologies, particularly chatbots, virtual assistants, simulation, and virtual reality, significantly influence the teaching and learning of entrepreneurship education in public universities. These technologies enhance engagement, support personalized learning, and facilitate experiential skill development. Their integration contributes meaningfully to improving instructional delivery and learning outcomes in entrepreneurship education.

Recommendations

Public universities should invest in structured training programmes that equip educators with both technical and pedagogical competencies required for effective integration of chatbots and virtual assistants. Furthermore, universities should strengthen collaboration with industry partners to develop relevant simulation and virtual reality environments that reflect realworld entrepreneurial contexts, thereby enhancing the practical relevance of entrepreneurship education.

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