

**STRATEGIES FOR EFFECTIVE INTEGRATION OF ARTIFICIAL INTELLIGENCE
IN TEACHING AND LEARNING OF BUSINESS EDUCATION IN COLLEGES OF
EDUCATION IN ANAMBRA STATE, NIGERIA**

Ngozika Kelechi-Ejike,

Okeke, Bethel

and

Ibeh, Maryann Chisom

School of Business Education, Federal College of Education (Tech) Umunze

Abstract

This study examined **strategies for effective integration of artificial intelligence in teaching and learning of Business Education in Colleges of Education in Anambra state, Nigeria**. A descriptive survey research approach was used for the study. The population is made up of 83 Business Educators, consisting of 66 Business Educators in FCETU and 17 Business Educators in NOCEN. The whole population was used because the size was manageable, hence, no sampling and sampling technique was used. A 15-item structured questionnaire was used to collect data from the respondents. The instrument was validated by three experts from the Faculty of Education, Nnamdi Azikiwe University, Awka. The instrument was pilot tested using 20 business educators in Federal College of Education (Tech), Asaba, Delta state who were not part of the study population. This was done to ensure the reliability of the instrument and the data collected was analyzed using Cronbach's Alpha. Overall reliability coefficient of 0.73 was obtained. Data were analyzed using mean and standard deviation. The findings indicated that needs assessment, professional and collaboration are strategies effective integration of Artificial Intelligence (AI) in Business Education in Colleges of Education in Anambra State, among others. It was recommended that the National Commission for Colleges of Education (NCCE) should mandate periodic needs assessments in all Colleges of Education to identify specific AI-related infrastructural, pedagogical, and capacity gaps in Business Education programmes, among others.

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Introduction

Artificial Intelligence (AI) represents a transformative force with the potential to redefine how systems understand, reason, and interact with their environments. AI is defined as the computer's capacity to perform tasks related to processes that require logical conclusions such as perceiving, interpreting, generalizing learning through past experiences and finding solutions like humans in the face of a given problem (Ferikoğlu & Akgün, 2022). AI offers innovative solutions to enhance learning experiences, streamline administrative tasks, and personalize instruction (Rane, et al., 2023; Sajja, et al., 2023). Moreover, AI-driven tools facilitate the analysis of vast amounts of educational data, enabling educators to glean valuable insights into student performance, learning trends, and instructional effectiveness (George & Wooden, 2023). By leverage AI, educators are able to monitor students' progress and performance and overall teaching effectiveness to enable them make modifications for enhanced performance. Additionally, AI-powered virtual reality and augmented reality applications offer immersive learning experiences that transcend traditional classroom boundaries. Eden et al., (2024) submitted that AI integration in education, highlights its potential to revolutionize traditional pedagogical approaches, personalize learning experiences, and streamline administrative tasks. Rather than functioning as a mere tool, AI, when properly integrated, becomes a fundamental component that empowers systems to adapt intelligently and respond to user needs with depth and personalization. The idea of AI integration extends beyond attaching algorithms to existing systems; it involves embedding intelligent capabilities directly into the core of products and services. This deep fusion allows AI not only to enhance performance but also to contribute meaningfully to decision-making, operational efficiency, and user experience (Munoko et al., 2020).

At its core, AI integration means intertwining machine learning, natural language processing, and other AI functions with digital infrastructure in a seamless manner. Wu (2023) submitted that this harmonization enables AI to become part of a system's DNA, allowing it to analyze data in real

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time, adapt to new patterns, and collaborate symbiotically with human users. In educational contexts, this could mean AI tools that personalize learning pathways, offer timely feedback, or assist educators with data-driven insights. Demirel et al., (2024) clarified that the vision is not to replace teachers, but to support them. This augments human judgment and creativity with AI's capacity to process vast datasets, detect patterns, and offer informed suggestions.

The benefits of AI integration are manifold. Rane, et al., (2023) submitted that personalization stands out as a critical gain, where AI learns from individual user behavior and adapts content or recommendations accordingly. Personalized learning promotes engagement and improves outcomes. Efficiency is another hallmark of integration. Sajja, et al., (2023) submitted that as AI takes on repetitive and data-heavy tasks, it frees educators and administrators which enables them to focus on higher-order responsibilities. This boosts efficiency. Moreover, integrated AI systems can bolster institutional security by continuously monitoring for threats and anomalies. George, and Wooden (2023) noted that with continuous learning and model refinement, AI systems improve over time, offering even more precise insights and support. In all of this, decision augmentation becomes a valuable asset where AI provides analysis that informs and supports strategic choices.

However, achieving these benefits is not without its challenges. Many institutions grapple with legacy systems that lack the technological maturity to support modern AI integration. Sezgin et al., (2022) submitted that disorganized or siloed data can further hinder AI's effectiveness, as meaningful outputs depend on the quality and structure of the data it processes. Ethical considerations also arise, particularly when AI is involved in decision-making processes that impact individuals. Issues of fairness, bias, and transparency demand careful attention (Tortora, 2024). AI should be used ethically to ensure equity and inclusiveness. Additionally, Bianchi (2024) submitted that the fear of job displacement, though often overstated, poses a psychological barrier to AI adoption, especially among staff concerned about automation. Effective change management is therefore critical to foster trust and facilitate adoption.

Understanding the nature, benefits, and challenges of AI integration provides a foundational perspective for exploring its application in education. As institutions seek to improve teaching and learning through innovation, thoughtful AI integration emerges as a strategic imperative - one that, when well executed, can elevate the educational experience for both learners and teachers. To buttress this fact, Eden et al., (2024) warned that stakeholders must navigate the complexities of AI integration with foresight and responsibility, ensuring that AI enhances educational equity, accessibility, and effectiveness. There are certain effective strategies for integrating AI into teaching and learning. Luan, et al., (2020); Rane, et al., (2023); Sajja, et al., (2023), Eden et al., (2024) elucidated that it is essential to recognize that realizing the opportunities offered by AI requires careful planning, investment, and collaboration among educators, policymakers, and technology developers to ensure that AI is used responsibly and ethically to support the diverse needs and aspirations of all learners. This is to underpin the fact that AI integration entails the use of certain strategies. Strategies are plans of actions designed to achieve a particular goal or set of goals.

An essential strategy for the effective integration of artificial intelligence (AI) in teaching and learning is the conduct of a thorough needs assessment. Wang et al., (2023) submitted that before adopting AI tools, educational institutions must evaluate the specific learning challenges and opportunities within their student populations. This involves identifying gaps in instructional delivery, areas of potential improvement, and learner diversity. Tailoring AI applications to address these contextualized needs ensures that the technology is not imposed in a generic fashion but is purposefully aligned with educational goals. FAMILONI and Onyebuchi (2024) posited that a well-executed needs assessment allows institutions to deploy AI solutions that are relevant, impactful, and capable of enhancing pedagogical outcomes. Without such strategic evaluation, AI adoption may fall short of expectations, leading to underutilization or misalignment with learning objectives. To support these assessments, global initiatives are already laying the groundwork. For instance, Eden et al., (2024) noted that the World Bank (WB) and Inter-American Development Bank (IDB) have collaborated to develop public goods such as tools that help diagnose school connectivity gaps, identify optimal AI solutions, and estimate costs for implementation. These

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tools not only facilitate effective needs assessments but also support data-driven decision-making for AI integration. Moreover, by working with the private sector to secure additional funding and offering technical support, these institutions are helping low- and middle-income countries bridge infrastructural disparities.

Professional development represents another critical component in the successful integration of AI into educational environments. Eden et al., (2024) submitted that educational institutions must invest in professional development to support the effective integration of AI technologies in classrooms. Teachers are central to the meaningful use of AI in the classroom, and their readiness determines the extent to which AI tools can be leveraged effectively. Ongoing training programmes should equip teachers with the technical know-how to operate AI systems and, more importantly, with pedagogical insights into how AI can support differentiated instruction, personalized learning, and real-time student feedback. Kumar and Chen (2024) submitted that preparing educators to effectively integrate AI technologies through professional development programmes is essential and such programmes must cover not only technical skills for using AI systems, but also pedagogical strategies for incorporating them into curriculum and instruction. Ajzenman et al., (2023) also submitted that up skilling for teachers is crucial to acquaint them with the use of AI tools and how AI can address diverse learning needs and accelerate learning. Capacity building should go beyond initial training to include sustained support mechanisms such as coaching, collaborative learning communities, and access to instructional resources. The importance of developing teacher capacity has been acknowledged by international actors. Demszky (2023) submitted that the IDB and World Bank are currently working on an open digital skill platform that supports countries in identifying context-relevant digital competencies for teachers, developing these skills, and evaluating the effectiveness of related training programs. Likewise, UNESCO (2023) offered a structured roadmap for equipping educators with the knowledge and competencies needed to integrate AI and other digital technologies effectively into instruction. These global frameworks help standardize teacher preparation, ensuring that AI enhances rather than diminishes the central role of educators in the learning process. World Bank (2023) explained that by empowering teachers with both competence and confidence, professional

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development fosters a culture where AI is used not as a novelty but as a transformative force in education. Additionally, countries like Chile are setting examples by creating national guidance documents for educators. Chile's Ministry of Education, for instance, released a guide for teachers on using ChatGPT to promote active learning, emphasizing responsible use, limitations, and practical recommendations. Such resources provide timely and actionable strategies for integrating emerging AI tools into real-world classroom practices.

Collaboration is equally pivotal in ensuring the effective integration of AI in teaching and learning (Bianchi, 2024). The complexity of AI technologies necessitates partnerships between teachers, technology developers, policymakers, and other stakeholders (World Bank, 2020). Through collaborative frameworks, AI solutions can be co-created to align with educational standards and teaching practices, ensuring their relevance and acceptance within school systems. Moreover, Chan (2023) posited that collaboration fosters knowledge exchange, resource sharing, and the pooling of expertise needed to navigate technical, ethical, and infrastructural challenges. Schools that engage in partnerships with technology providers or academic institutions can gain access to cutting-edge tools, practical implementation strategies, and valuable feedback loops. Such collaborative efforts promote innovation, mutual learning, and a shared commitment to equity and excellence in AI-enhanced education. At a broader level, fostering AI fluency at the organizational level is equally critical. AI-fluent institutions can adapt to evolving technologies, identify integration opportunities across curriculum and operations, and iteratively refine their use of AI for maximum impact. To develop this fluency, education systems must build institutional capacity by establishing dedicated AI teams, offering continuous professional development for administrators and staff, and cultivating a culture of experimentation and innovation. Chen et al., (2022) summed that partnerships with AI experts, research organizations, and global networks ensure that educational institutions remain at the forefront of best practices and technological advancements. Using these strategies will ensure an effective integration of AI in teaching and learning, specifically, Business Education.

Business education is an academic programme that helps individuals adjust to their business environment. Olupayimo (2018) summarizes business education as a discipline that exposes its recipients to diverse curricula and inculcates in them the attitudes, knowledge, skills, and values required in the business world. Business education programmes strive to equip individuals with skills and competencies to work in an office, teach as professionals, or become self-reliant entrepreneurs. The discipline is offered in university and in college of education. A college of education is a higher educational institution that prepares individuals to be practitioners as well as leaders in education and related human service fields by deepening and expanding understanding of education as a fundamental human endeavour in helping society define and respond to its educational responsibilities and challenges (Unegbu, et al., 2024).

The researchers' observations of the college of education system in Anambra state seem to suggest that AI has not been effectively integrated in Business Education programmes in colleges of education in Anambra state. For instance, the institutions do not collaborate with IT experts in AI integration and educators appear not to have been trained on the ethical use of AI. This limits the maximization of the potentials of AI. This study, therefore, seeks to examine strategies for effective integration of AI in teaching and learning of Business Education in colleges of education in Anambra state.

Statement of the Problem

In today's digitally driven world, Artificial Intelligence (AI) has emerged as a transformative force in education, offering innovative approaches to teaching and learning. Ideally, Colleges of Education especially in the area of Business Education ought to leverage AI to personalize learning, improve instructional delivery, and enhance student outcomes. Effective AI integration demands strategic planning, which includes proper needs assessment, continuous professional development of teachers, and collaborative practices across stakeholders.

However, in many Colleges of Education, these foundational strategies appear to be often lacking. There seem to be little evidence of comprehensive needs assessments to identify infrastructure, skill gaps, or pedagogical requirements for AI integration. Professional development opportunities

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for educators are often sporadic and underfunded, probably leaving many teachers ill-equipped to adopt AI tools. Furthermore, institutional collaboration among departments, with external partners, or within teaching teams is often weak or nonexistent.

As a result, the integration of AI in the teaching and learning of Business Education is often suboptimal, probably leading to underutilized technologies, poorly prepared graduates, and an education system that lags behind global trends. These challenges reveal a critical gap that must be addressed to position Business Education in Colleges of Education for relevance and sustainability in the digital era. This study, therefore, investigates how needs assessment, professional development, and collaboration can serve as effective strategies for integrating AI in Business Education.

Purpose of the Study

The main purpose of this study is to determine **strategies for effective integration of artificial intelligence in teaching and learning**. Specifically, the study sought to examine:

5. Needs assessment as a strategy **for effective integration of artificial intelligence in teaching and learning** of Business Education in Colleges of Education in Anambra state.
6. Professional development of teacher as a strategy **for effective integration of artificial intelligence in teaching and learning** of Business Education in Colleges of Education in Anambra state.
7. **Collaboration as a strategy for effective integration of artificial intelligence in teaching and learning** of Business Education in Colleges of Education in Anambra state.

Research Questions

The following research questions guided the study. In what ways are:

1. Needs assessment a strategy **for effective integration of artificial intelligence in teaching and learning** of Business Education in Colleges of Education in Anambra state?

2. Professional development of teacher a strategy **for effective integration of artificial intelligence in teaching and learning** of Business Education in Colleges of Education in Anambra state?
3. **Collaboration a strategy for effective integration of artificial intelligence in teaching and learning** of Business Education in Colleges of Education in Anambra state?

Methods

The study employed a descriptive survey design and opinions of Business educators were sought in line with the research design. The study was carried out in the two Colleges of Education in Anambra state- Nwafor Orizu College of Education, Nsugbe (NOCEN) and Federal College of Education (Tech), Umunze (FCETU). The population is made up of 83 Business Educators, consisting of 66 Business Educators in FCETU and 17 Business Educators in NOCEN. The whole population was used because the size was manageable, hence, no sampling and sampling technique was used. The instrument for data collection was a questionnaire constructed by the researchers based on the research questions. The questionnaire was made up of 15 items and was divided into three: Part 1, Part 2 and 3. Part 1 with 5 items to elicit information on ways needs assessment is a strategy **for effective integration of artificial intelligence in teaching and learning** of Business Education, Part 2 with 5 items to elicit information on ways professional development is a strategy **for effective integration of artificial intelligence in teaching and learning** of Business Education, and Part 2 has 5 items which covered ways are collaboration a strategy **for effective integration of artificial intelligence in teaching and learning** of Business Education. The instrument was validated by three experts from the Faculty of Education, Nnamdi Azikiwe University, Awka. The instrument was pilot tested using 20 business educators in Federal College of Education (Tech), Asaba, Delta state who were not part of the study population. This was done to ensure the reliability of the instrument and the data collected was analyzed using Cronbachs' Alpha. Overall reliability coefficient of 0.73 was obtained and was considered to be acceptable for

the study. The questionnaire was administered by the researchers using direct administration method. Out of the 83 copies of the questionnaire administered only 69 copies were used for analysis representing about 83.13% return rate. The other 14 copies were either not duly filled or not retrieved. The data obtained were analyzed using mean based on the 4-point scale ranging from strongly agreed extent of 4 points to strongly disagreed of 1 point. Any item with a mean response of 2.50 and above was considered 'agreed' while items with a mean response below 2.50 was considered 'disagreed'.

Results

Research Question One: In what ways are needs assessment a strategy for effective integration of artificial intelligence in teaching and learning of Business Education in Colleges of Education in Anambra state?

Table 1: Mean Ratings of Respondents on ways needs assessment is a strategy for effective integration of artificial intelligence in teaching and learning of Business Education in Colleges of Education in Anambra state

S/N	ITEMS	X	SD	REMARK
1	Conducting a thorough needs assessment helps identify gaps in AI knowledge among teachers and students.	3.06	.79	Agreed
2	Needs assessment enables institutions to determine the infrastructure required for effective AI integration.	2.81	.69	Agreed
3	Regular assessment of staff and student readiness is essential for planning AI adoption strategies	3.29	.68	Agreed
4	Results from needs assessments guide the selection of suitable AI tools for teaching and learning.	3.35	.69	Agreed
5	Needs assessment helps align AI integration strategies with institutional goals in Business Education.	2.84	.70	Agreed
	Cluster mean	3.07	.62	Agreed

Table 1 shows that the mean score for all the 5 items have mean ratings greater or equal to the cut-off mean of 2.50. The cluster mean score of 3.07 shows that the respondents agree that they are ways needs assessment is a strategy **for effective integration of artificial intelligence in teaching and learning** of Business Education in Colleges of Education in Anambra state. The standard deviation for all the items is within the same range showing that the respondents are not wide apart in their ratings.

Research Question Two: In what ways are professional development a strategy **for effective integration of artificial intelligence in teaching and learning** of Business Education in Colleges of Education in Anambra state?

Table 2: Mean Ratings of Respondents on ways professional development is a strategy for effective integration of artificial intelligence in teaching and learning of Business Education in Colleges of Education in Anambra state

/N	ITEMS	X	SD	REMARK
1	Professional development equips teachers with the skills needed to use AI tools in Business Education.	2.89	.67	Agreed
2	Continuous training programs improve teacher confidence in adopting AI in their instructional delivery.	3.07	.62	Agreed
3	AI-focused workshops and seminars help teachers stay updated with emerging technologies	3.04	.62	Agreed
4	Institutions should sponsor teachers to attend conferences on AI in education	2.85	.71	Agreed
5	Training in digital pedagogy is essential for effective integration of AI in Business Education classrooms.	2.89	.67	Agreed
	Cluster mean	2.95	.68	Agreed

Table 2 shows that the mean score for all the 5 items have mean ratings greater or equal the cut-off mean of 2.50. The cluster mean score of 2.95 shows that the respondents agree that they are ways professional development is a strategy **for effective integration of artificial intelligence in teaching and learning** of Business Education in Colleges of Education in Anambra state. The

standard deviation for all the items is within the same range showing that the respondents are not wide apart in their ratings.

Research Question Three: In what ways are collaboration a strategy **for effective integration of artificial intelligence in teaching and learning** of Business Education in Colleges of Education in Anambra state?

Table 3: Mean Ratings of Respondents on ways collaboration is a strategy for effective integration of artificial intelligence in teaching and learning of Business Education in Colleges of Education in Anambra state

S/N	ITEMS	X	SD	REMARK
1	Collaboration between teachers and IT experts enhances the implementation of AI in teaching	3.11	0.92	Agree
2	Peer mentoring among lecturers promotes shared knowledge and effective AI use.	2.56	0.82	Agree
3	Collaborations with external organizations can provide access to AI tools and resources.	3.25	0.88	Agree
4	Students benefit when teachers collaborate to design AI-enhanced lesson plans.	2.61	0.87	Agree
5	Cross-departmental collaboration strengthens institutional capacity for AI integration.	2.56	0.92	Agree
	Cluster mean	2.82	0.80	Agree

In Table 3, all the 5 items have mean ratings greater or equal the cut-off mean of 2.50. The cluster mean score of 2.82 shows that the respondents agree that they are ways collaboration is a strategy **for effective integration of artificial intelligence in teaching and learning** of Business Education in Colleges of Education in Anambra state. The standard deviation for all the items is within the same range showing that the respondents are not wide apart in their ratings.

Discussion of Findings

The findings from the first research question reveal that needs assessment is a critical strategy for the effective integration of Artificial Intelligence (AI) in Business Education in Colleges of

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Education in Anambra State. The respondents agreed that needs assessment helps identify gaps in AI knowledge, informs infrastructure requirements, and ensures alignment with institutional goals. This finding aligns with Wang et al. (2023), who emphasized that a well-executed needs assessment is essential to tailoring AI applications to context-specific challenges in education. Similarly, it aligned with the submission of FAMILONI and ONYEBUCHI (2024) that aligning AI solutions with identified gaps improves pedagogical outcomes. These findings highlight that AI cannot be effectively integrated without a contextual understanding of the learning environment. However, this contradicts findings by Sezgin et al. (2022), who argued that institutions often achieve AI adoption through generic frameworks without in-depth needs assessments. The likely reason for this contradiction may be due to differing infrastructural readiness and policy contexts between developed countries (as in Sezgin et al.'s study) and developing settings like Nigeria.

The results from the second research question show that professional development is a vital strategy for effective AI integration. Respondents affirmed that continuous training, workshops, and seminars help educators build the confidence and skills needed to utilize AI tools in Business Education. This supports the assertions of Eden et al. (2024), Kumar and Chen (2024), and Ajzenman et al. (2023), who all emphasized the role of teacher training in enhancing AI adoption and application. The agreement among respondents underscores that without adequate teacher capacity, AI tools may be underutilized or misapplied. Interestingly, this finding partially contradicts Wu (2023), who noted that some institutions have succeeded in AI adoption without structured professional development by relying on intuitive interfaces and external consultants. The difference in findings may be attributed to contextual factors such as digital literacy levels and accessibility to external expertise, which are typically lower in resource-constrained environments like Anambra State.

The third finding demonstrates that collaboration is a strategic driver of effective AI integration. Participants acknowledged that collaboration with IT experts, peer mentoring, cross-departmental cooperation, and external partnerships enhance AI implementation. This finding aligns with the views of Bianchi (2024), Chan (2023), and Chen et al. (2022), who highlighted that collaborative frameworks promote knowledge exchange, innovation, and co-creation of AI tools suited to

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educational needs. The result further affirms the idea that AI integration is not solely a technical process but a relational one that thrives on stakeholder synergy. However, this contradicts the more individualistic model promoted by Munoko et al. (2020), who suggested that AI adoption can be effectively driven by institutional leadership without necessarily engaging in extensive collaboration. The divergence may stem from differing organizational cultures and governance structures between centralized and participatory education systems.

Conclusion

This study investigated strategies for the effective integration of Artificial Intelligence in the teaching and learning of Business Education in Colleges of Education in Anambra State. The study revealed that needs assessment, professional development, and collaboration are key enablers of successful AI integration. Specifically, needs assessment ensures contextual relevance, professional development equips educators with necessary competencies, and collaboration facilitates access to resources and expertise. These findings underscore the need for strategic, inclusive, and context-driven approaches in integrating AI to enhance teaching and learning outcomes in Business Education.

Based on the findings, the following are recommended:

- (1) The National Commission for Colleges of Education (NCCE) should mandate periodic needs assessments in all Colleges of Education to identify specific AI-related infrastructural, pedagogical, and capacity gaps in Business Education programmes.
- (2) Ministry of Education should establish and fund continuous professional development programs focused on AI integration for Business Education lecturers, including hands-on training and digital pedagogy workshops.

- (3) The management of Nwafor Orizu College of Education, Nsugbe, and Federal College of Education (Technical), Umuze, should initiate and strengthen collaborations with IT firms, universities, and global AI research networks to facilitate co-creation, training, and deployment of AI tools tailored for their academic context.

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